
A SYNOPSIS OF THE GENUS *TACHIGALI* (LEGUMINOSAE: CAESALPINIOIDEAE) IN NORTHERN SOUTH AMERICA¹

Henk van der Werff²

ABSTRACT

A synoptic treatment of the *Tachigali* Aubl., including *Sclerolobium* Vogel, in northern South America (Colombia, Venezuela, Guyana, French Guiana, Suriname, Amazonian Brazil, Ecuador, and Peru) is presented and contains brief descriptions of, and a key to, the 54 species recognized in northern South America. Ten species, *T. barnebyi* van der Werff, *T. bicornuta* van der Werff, *T. candelabrum* van der Werff, *T. cenepensis* van der Werff, *T. chrysaloides* van der Werff, *T. ferruginea* van der Werff, *T. fusca* van der Werff, *T. inconspicua* van der Werff, *T. loretensis* van der Werff, and *T. vaupesiana* van der Werff, are newly described. Three overlooked names published by Tulasne (*T. glauca*, *T. poeppigiana*, and *T. richardiana*) have been taken up again. One new combination, *T. melanocarpa* (Ducke) van der Werff, is proposed. Lectotypes are designated for three species, *T. alba* Ducke, *T. melanocarpa*, and *T. plumbea* Ducke. The following species are placed in synonymy: *Sclerolobium froesii* Pires in *T. bracteosa* (Harms) Zarucchi & Pipoly; *T. tessmannii* Harms in *T. formicarum* Harms; *T. myrmecophila* (Ducke) Ducke in *T. glauca*; *S. radlkoferi* Rusby, *S. uleanum* Harms, and *S. subbullatum* Ducke in *T. guianensis* (Benth.) Zarucchi & Herend.; *T. grandiflora* Huber, *T. ulei* Harms, *T. rusbyi* Harms, and *T. pulchra* Dwyer in *T. paniculata* Aubl.; *T. sulcata* Benoist and *T. bracteolata* Dwyer in *T. richardiana*; and *T. reticulosa* (Dwyer) Zarucchi & Herend. in *T. tinctoria* (Benth.) Zarucchi & Herend.

Key words: Northern South America, *Sclerolobium*, *Tachigali*, taxonomy.

TAXONOMIC HISTORY

The genus *Tachigali* was described by Aublet (1775), who recognized two species, *T. paniculata* Aubl. and *T. trigona* Aubl., both from French Guiana. The main difference between the two species given by Aublet was the position of the leaflets: opposite in *T. paniculata* and alternate in *T. trigona*. Jussieu (1789) introduced the orthographic variant “*Tachigalia*”; all later authors followed this until Lewis (1987) returned to the original spelling “*Tachigali*.” Tulasne (1844) designated *T. paniculata* as the type species of the genus. Subsequently, the name *T. trigona* largely disappeared from use; Dwyer (1954) mentioned it as a synonym of *T. paniculata*, a disposition followed in this treatment. In 1837, Vogel published the genus *Sclerolobium*, with three species from central Brazil. Dwyer (1957a) designated *S. denudatum* Vogel as the type species. Bentham (1840) published a new species, *T. pubiflora* Benth., from Guyana. Tulasne (1844) treated *Tachigali* and included five species, four newly described, in the subgenus *Tachigali*, and two new species in his subgenus *Cosymbe* Tul. The subgenus *Tachigali* was characterized by dimorphic

stamens, with three being thicker and backwards curved and seven longer and straight, and the ovary attached to the side of the hypanthium, while in subgenus *Cosymbe*, all 10 stamens are equal and the ovary is attached to the bottom of the hypanthium. Tulasne also treated two species in *Sclerolobium*, one of which, *S. sericeum* Tul., was newly described.

The names published by Tulasne have generally been ignored by later authors. Poeppig (1845) described two species, one in *Tachigali* and one in *Sclerolobium*, both of which had been described by Tulasne (1844) with the same collections as types. In a report on the plants collected by Spruce in Pará, Bentham (1850) gave a summary of *Sclerolobium*, in which he recognized nine species, three of which were newly described. In *Flora Brasiliensis*, Bentham (1870) listed 10 species of *Sclerolobium* and three species of *Tachigali*. Taubert, in Engler and Prantl (1892), accepted five species in *Tachigali* and 12 species in *Sclerolobium*. Taubert divided *Sclerolobium* in two sections, section *Eusclerolobium* (10 species) with linear petals and section *Platypetalum* (two species) with more or less broad petals. One of the two species in section *Platypetalum*, *S. aureum* (Tul.)

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² Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166, U.S.A. henk.vanderwerff@mobot.org.
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Baill., had been placed by Tulasne (1844) in subgenus *Cosymbe* of *Tachigali*. Rusby (1896) described a new species of *Sclerolobium* from Bolivia.

From about 1900 onward, a sizable number of new species were described by two botanists working in Brazil, Huber and Ducke. Huber (1908) first described two new species of *Tachigali* followed by three new species of *Sclerolobium* (Huber, 1910). Ducke (1915, 1922, 1935, 1938, 1944) described nine species of *Sclerolobium* and six species of *Tachigali*. Ducke was an excellent collector, knew the species well from his field experience, and contributed greatly to our knowledge of *Tachigali*. His observations on habitat preference of the various species are very valuable. For most species described by Ducke, he used his own collections as type specimens.

In the same period, Harms (1903, 1906, 1915, 1922, 1926, 1940) described five species of *Sclerolobium* and five species of *Tachigali*. Harms studied collections made by other botanists (Ule, Tessmann, Weberbauer, Rusby, Melinon) and had not seen the plants in the field. Several of the species described by him have been placed in synonymy by later authors. Benoist (1919) added a species of *Sclerolobium* and later a species of *Tachigali* (Benoist, 1925), both based on his own collections. Macbride (1943) described *S. rigidum* J. F. Macbr. based on a Klug collection from Peru. The next major contribution was made by Dwyer, who published a revision of *Tachigali* in 1954, including the descriptions of three new species and a new variety, followed by a revision of *Sclerolobium* (Dwyer, 1957a) with the descriptions of one new species and three new varieties from the area covered by this synopsis. A key to the largest group of *Sclerolobium* was published separately (Dwyer, 1957b). Dwyer (1958) published an additional species of *Tachigali*, *T. schultesiana* Dwyer, from Colombia. Since 1960, five species of *Sclerolobium* have been described: *S. froesii* Pires (Pires, 1960), *S. dwyeri* R. S. Cowan, *S. pimichinense* R. S. Cowan (Cowan, 1961), *S. micranthum* L. O. Williams (Williams, 1965), and *S. prancei* H. S. Irwin & Arroyo (Irwin & Arroyo, 1974). Only one species of *Tachigali* has been described since Dwyer's publications: *T. vasquezii* Pipoly (Pipoly, 1995). With the large number of species in *Sclerolobium* and *Tachigali*, it became increasingly clear that the differences between the two genera were tenuous, and there is now a general consensus that the two genera should be merged under the older name *Tachigali*. Several species of *Sclerolobium* were recently transferred to *Tachigali* or given new names in three floras and a checklist (Zarucchi & Herendeen, 1993; Pipoly, 1995; Barneby, 1996; Zarucchi, 1998).

TACHIGALI VERSUS SCLEROLOBIUM

In the original publication of *Tachigali*, Aublet (1775) listed, among others, the following characters: stamens unequal, with three short, erect and pressed against the upper petals, and seven slender, resting on the lower petals; petals unguiculate; upper three petals reflexed, the lower two spreading; four sepals erect and one bent down. Vogel (1837) did not mention unequal stamens or differences in the orientation of the sepals and petals in his description of *Sclerolobium*; he did mention that the petals were thread-like, linear or nearly so ("fila angustissimo-lineararia"). In his description of *Tachigali*, Vogel mentioned unequal petals, unequal stamens, and the attachment of the stipe of the ovary to the upper side of the hypanthium. The species on which these descriptions were based represent the extremes of the range of floral variation found in the *Tachigali*–*Sclerolobium* complex. Tulasne (1844) recognized two subgenera in *Tachigali*: subgenus *Tachigali*, characterized by unequal stamens and the pistil inserted along the upper wall of the hypanthium, and subgenus *Cosymbe*, with equal stamens and the pistil inserted at the bottom (or center) of the hypanthium. The latter subgenus was placed in *Sclerolobium* by later authors (as section *Platypetalum* [Taubert, 1892]) (Dwyer, 1957a). The place of attachment of the pistil was a character first used by Tulasne and became later correlated with the shape of the calyx cup: symmetrical when the pistil is inserted at the bottom of the hypanthium, oblique when the pistil is attached along the side of the hypanthium.

During the past two decades, several authors have indicated a close relationship between the two genera. In 1993, Gentry stated *Sclerolobium* "is probably not adequately distinct from *Tachigali*." Zarucchi and Herendeen (1993) merged *Sclerolobium* in *Tachigali*, as did Barneby and Heald in Mori et al. (2002), Pennington et al. (2004), Lewis in Lewis et al. (2005), and Silva and Lima (2007). Detailed reasons for merging *Sclerolobium* and *Tachigali* were, however, not presented in any of these publications. The present study finds that the species of *Tachigali* can be divided into five groups based on the characters used by Aublet, Vogel, and Tulasne (petals linear or broad; stamens equal or unequal; hypanthium symmetrical or asymmetrical; and sepals and petals erect or spreading/reflexed). These species groups are presented in Table 1. The first and largest group corresponds with *Sclerolobium* sensu Vogel; the second group with *Tachigali* subg. *Cosymbe* sensu Tulasne (= *Sclerolobium* sect. *Cosymbe* sensu Dwyer); the third group is close to subgenus *Cosymbe*, but differs in having flowers with spreading sepals and

Table 1. Species groups in *Tachigali*. Names in boldface refer to species that are not monocarpic (collections exist with leaves and fruits); italicized names refer to species with swollen domatia in the leaf stalk.

Group 1: petals linear, stamens equal, calyx symmetrical, sepals/petals erect					Group 2: petals broad, stamens equal, calyx symmetrical, sepals/petals erect		Group 3: petals broad, stamens equal, calyx symmetrical, sepals/petals spreading		Group 4: petals broad, stamens equal, calyx asymmetrical, sepals/petals spreading		Group 5: petals broad, stamens unequal, calyx asymmetrical, sepals/ petals spreading	
<i>T. amplifolia</i>	<i>T. macbridei</i>	<i>T. candellabrum</i>	<i>T. dwyeri</i>	<i>T. alba</i>	<i>T. barnebyi</i>							
<i>T. bracteosa</i>	<i>T. melanocarpa</i>	<i>T. davidsei</i>	<i>T. micrantha</i>	<i>T. argyrophylla</i>	<i>T. catingae</i>							
<i>T. ceneensis</i>	<i>T. melinonii</i>	<i>T. ferruginea</i>	<i>T. micropetala</i>	<i>T. glauca</i>	<i>T. cavipes</i>							
<i>T. chrysaloides</i>	<i>T. odoratissima</i>	<i>T. formicarum</i>		<i>T. grandistipulata</i>	<i>T. colombiana</i>							
<i>T. chrysophylla</i>	<i>T. paraensis</i>	<i>T. macropetala</i>		<i>T. loretensis</i>	<i>T. longiflora</i>							
<i>T. eriopetala</i>	<i>T. peruviana</i>			<i>T. poeppigiana</i>	<i>T. macrostachya</i>							
<i>T. fusca</i>	<i>T. physophora</i>			<i>T. schultesiana</i>	<i>T. paniculata</i>							
<i>T. goeldiana</i>	<i>T. pimichinensis</i>				<i>T. plumbea</i>							
<i>T. guianensis</i>	<i>T. prancei</i>				<i>T. ptychophysca</i>							
<i>T. hypoleuca</i>	<i>T. setifera</i>				<i>T. pubiflora</i>							
<i>T. inconspicua</i>	<i>T. tinctoria</i>				<i>T. richardiana</i>							
<i>T. leiocalyx</i>	<i>T. vaupesiana</i>				<i>T. rigida</i>							
	<i>T. vulgaris</i>				<i>T. venusta</i>							

petals; the fourth group has previously been considered part of *Tachigali*; and the fifth group corresponds with *Tachigali* sensu Aublet. None of the groups differs in more than one character from its neighboring group(s). If *Sclerolobium* and *Tachigali* were both to be recognized at the generic level, they would be separated by a single character only. For instance, if *Sclerolobium* would be defined by linear petals, species in group 1 would be placed in *Sclerolobium* and those in groups 2, 3, 4, and 5 in *Tachigali*. However, if *Tachigali* would be defined by an asymmetrical hypanthium, species in groups 4 and 5 would form *Tachigali* and those in groups 1, 2, and 3 would be placed in *Sclerolobium*. Recognition of such single character genera is not recommended. Therefore, in this study, as in other recent treatments mentioned above, *Sclerolobium* is included in *Tachigali*.

CHARACTERS USEFUL IN IDENTIFICATION

FLOWERS

Flowers are almost indispensable for the identification of *Tachigali* specimens. The indument of the calyx is rather uniform in most species, but a few have glabrous calyx lobes. The shape of the hypanthium, symmetrical or asymmetrical, is of more importance. In about half the species the petals are linear; the other half have broad, more or less showy petals. The linear petals can be difficult to recognize because they closely resemble the filaments of the stamens, but they can usually be told apart by a slight difference in color. The linear petals are densely pubescent on the distal half in a number of species, and the pubescence is usually of yellow hairs, but in one species, *T. paraensis* (Huber) Barneby, the hairs are white. There is also variation among the species with broad petals. In some species, the petals are erect, shorter than, or as long as the sepals and largely covered by them, while in others, the petals are spreading to reflexed and easily seen. This study did not find the amount of pubescence on the inner surface of the petals to be a useful character for discriminating species. The number of stamens is generally 10, with one exception: *T. macrostachya* Huber is described as having 15 (16 to 19) stamens. In the flowers seen for this treatment, the number of stamens is approximately 15, but because it is not uncommon for a few stamens to break off, the original number may well have been higher. Stamens may be equal or unequal in length; in the latter case, two or three stamens are shorter, thicker, and curved. The lower part of the filaments is nearly always densely pubescent. This study did not find the distribution or the density of

pubescence on the ovary to be of taxonomic significance; even in very young fruits the pubescence falls early.

STIPULES

Stipules have not been seen for 17 of the 54 species included in this treatment. In a number of species, they were difficult to find or rarely present. Three main types of stipules are found in *Tachigali*. In 23 species, stipules were pinnately divided, with one to three pairs of lobes; the lobes were flat and of varying width but never thread-like. This is the foliose stipule type (Figs. 1A, B, 4D). In nine species, the stipules were pinnately divided but with thread-like segments. This is the pectinate stipule type (Fig. 1C, D). The remaining six species had entire stipules (rarely with a single pair of lobes); these stipules were strongly revolute and subcylindrical in cross section (Fig. 1E, F). In some cases, small bracts resembling revolute stipules were present in the inflorescences. Such bracts occurred in flowering specimens of *T. eriopetala* (Ducke) L. F. Gomes da Silva & H. C. Lima, but in sterile specimens of that species, revolute stipules at the base of the leaves were up to 5 cm long. Because the foliose stipule type occurs in quite a few species, they are not very useful for identification. Revolute stipules, however, are quite useful; sterile specimens of *T. eriopetala*, for instance, can be easily identified by the combination of stipule type and indument type on the lower surface of the leaflets. Within a species, there may be some variation in the size of stipule but not in the type of stipule.

DOMATIA

Domatia are swollen and hollow segments of the leaf stalk inhabited by ants; they are present in 26 species and absent in 29 species. Presence or absence of domatia seems to be characteristic for any given species, with the exception of *Tachigali paniculata*, where domatia can be present or absent. *Tachigali paniculata* has been included in both categories in the count. Shape and position of domatia sometimes aid identification. Domatia can be terete (Fig. 2A–C) or, when flat on the upper side of the leaf stalk, semiterete (Fig. 2D, E). In one species, *T. bicornuta* van der Werff, the domatia form two blunt horns (Fig. 4C). In *T. physophora* (Huber) Zarucchi & Herend., domatia are terete, often longitudinally ribbed, and almost never more than 1 cm from the base of the leaf stalk (Fig. 2A). In *T. chrysophylla* (Poepp.) Zarucchi & Herend., domatia are usually more than 4 cm from the base of the leaf stalk

(sometimes even 10 cm) and can be up to 4 cm long (Fig. 2B). Table 1 lists species with domatia in italics and shows that the majority of species belonging to the traditional concept of *Tachigali* (with an asymmetrical hypanthium and spreading petals, and dimorphic or equal stamens) possess domatia. *Tachigali longiflora* Ducke and *T. macrostachya*, two species listed in this group as lacking domatia, have hollow leaf stalks that are inhabited by ants, but in these species the leaf stalks are not swollen. Presence of domatia is much less common among species belonging to the traditional concept of *Sclerolobium*.

LEAFLETS

Leaflet characters such as size, number of lateral veins, pubescence, and shape of base and apex are of limited use in identification, and it is rarely possible to identify a specimen based only on leaflets. Characters that are uncommon in northern South American *Tachigali* such as leaflets with two to four pairs of secondary veins in *T. ptychophysca* Benth. and *T. lorentensis* van der Werff, or a cordate base in *T. macrostachya*, merely serve to confirm a determination based on other characters.

FRUITS

Some species of *Tachigali* are reported to be monocarpic (Foster, 1977), but it is not known how many display monocarpy. In known monocarpic species, fruiting is the last phase of life after the leaves have fallen, and it is not possible to connect fruiting specimens with flowers or leaves of other collections. Fruits on their own cannot be identified due to a lack of diagnostic characters. Occasionally, field observations indicate that a species is monocarpic; for instance, O. Poncy (pers. comm.) collected flowering material of *T. richardiana* Tul. in a permanent plot and, on returning a year later, found that all the trees had died. In the case of *T. formicarum* Harms, another monocarpic species, a collection consisting of fruits and a leaf rachis could only be identified because of the characteristic shape of the domatia. Species that are not monocarpic (known from collections with fruits and leaves) are listed in boldface in Table 1 and are fairly equally distributed among the species groups. The species of which fruits are not yet known might be monocarpic and/or are possibly rare so that fruits remain uncollected. For instance, *T. catingae* Ducke is known only from the flowering type collection and two additional sterile collections; therefore, in this case it would be premature to consider this species as monocarpic.

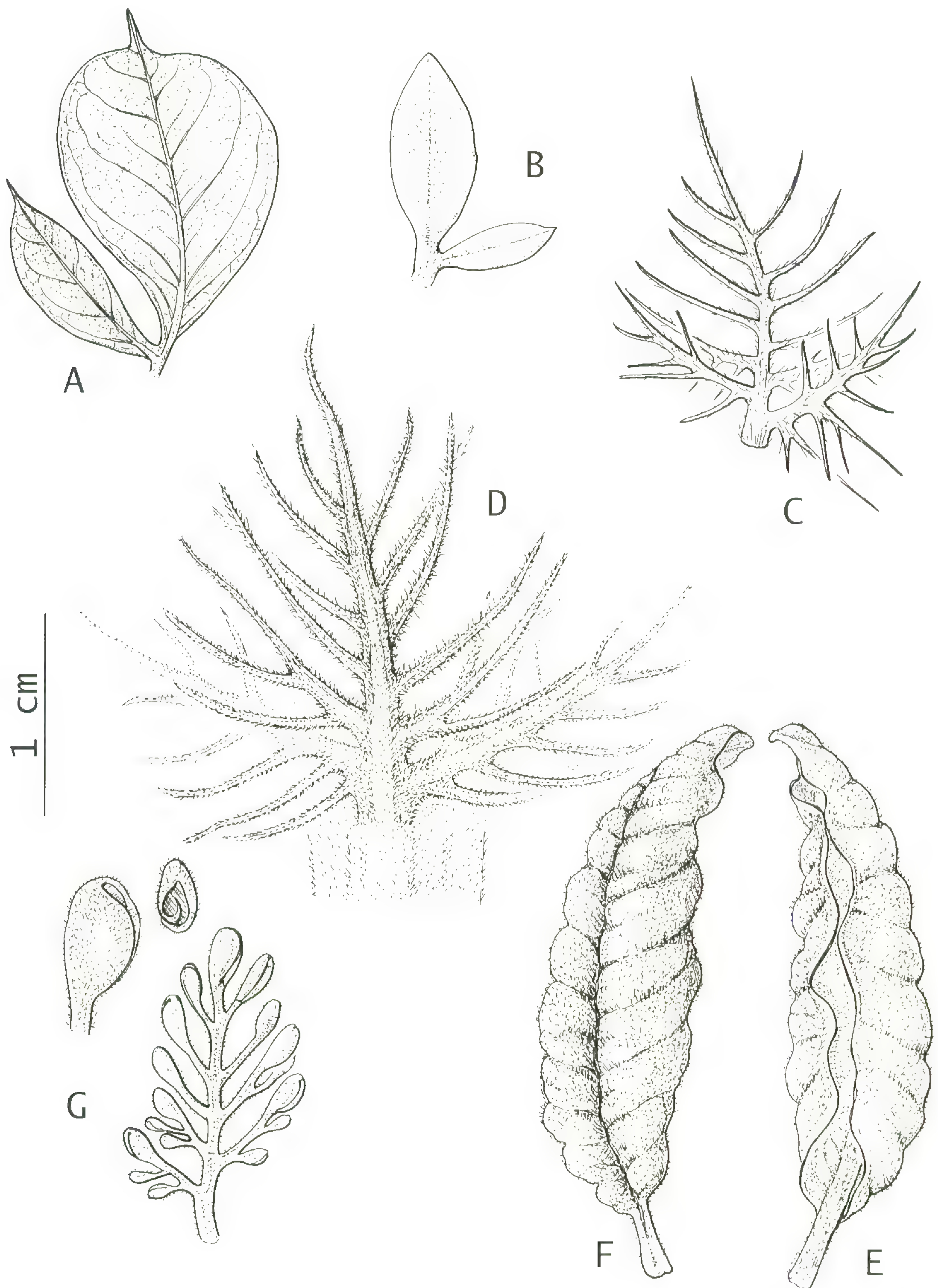


Figure 1. Stipules. —A. *Tachigali physophora* (Huber 530, US). —B. *T. cavipes* (Pires 7920, IAN). —C. *T. chrysophylla* (Steyermark 107178, US). —D. *T. ferruginea* (Neill 12932, MO). —E, F. *T. chrysaloides* (Dorr & Barnett 5824, NY). —G. *T. sp. 1* (Rickson B-44A-85, MO).

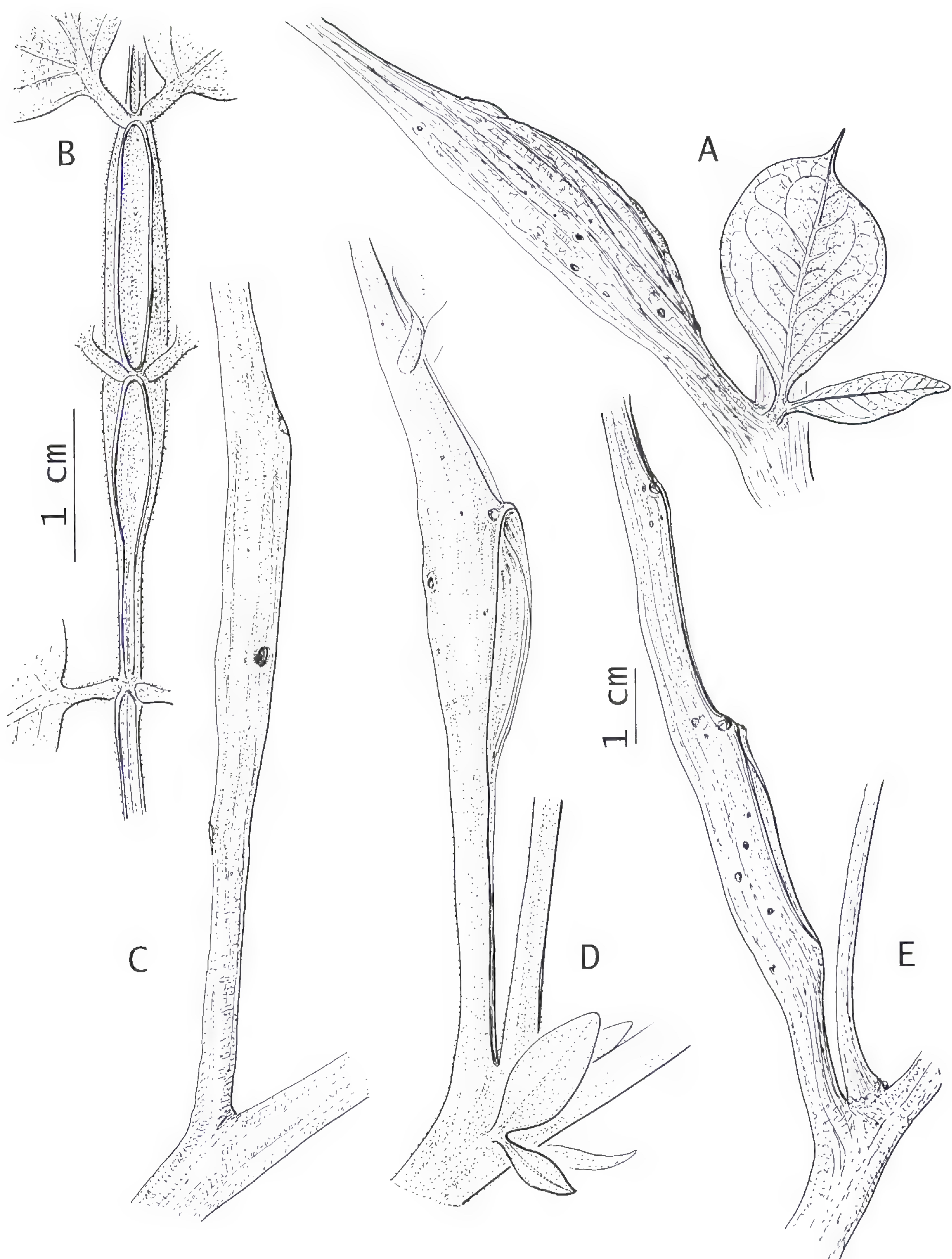


Figure 2. Domatia. —A. *Tachigali physophora* (Huber 530, US). —B. *T. chrysophylla* (Steiermark 107178, US). —C. *T. glauca* (Prance et al. 24720, US). —D. *T. cavipes* (Pires 7920, IAN). —E. *T. formicarum* (Schunke 5255, US). Scale bar at left applies to A–C; scale bar at right applies to D, E.

SCOPE OF THIS PROJECT

The treatment of *Tachigali* presented here was begun during preparation of an account for the *Flora del Río Cenepa* (Vásquez Martínez et al., in press). It soon became clear that identification of herbarium specimens was very difficult. Because large loans of specimens from an earlier attempt to study *Tachigali* were still at MO, it was decided to identify these collections as far as possible, write a key to the species, and combine this with brief notes in a synoptic treatment. This account only deals with the species from northern South America (Colombia, Venezuela, Guyana, French Guiana, Suriname, Amazonian Brazil [states of Amapá, Pará, Roraima, Amazonas, Acre], Ecuador, and Peru). The species in central and southern Brazil, Bolivia, and Paraguay are, for the most part, taxonomically different from those in northern South America, and, because not many collections from the southern area were at hand, this project was limited to species from northern South America. Identifications of the more than 1300 collections are not included in this treatment, but are available at: <<http://www.mobot.org/MOBOT/Research/NorthernSouthAmerica/NorthernSouthAmerica.shtml>>; click on the link to the Excel spreadsheet. This account is not a full monograph, and a number of problems remain to be studied in more detail, especially in the variable and widespread species *T. paniculata* and *T. guianensis* (Benth.) Zarucchi & Herend.

TAXONOMIC TREATMENT

Tachigali Aubl., Hist. Pl. Guiane 372. 1775. TYPE: *Tachigali paniculata* Aubl.

Sclerolobium Vogel, Linnaca 11: 395. 1837. TYPE: *Sclerolobium denudatum* Vogel.

Small to large trees, some species monocarpic. Leaves alternate, singly pinnate, paripinnate, leaflets opposite; leaf stalks sometimes swollen and harboring stinging ants; stipules present or caducous, pectinate, pinnate or entire, sometimes strongly revolute. Inflorescences terminal or lateral racemes or panicles; bracts lanceolate or subulate, often caducous. Flowers yellow, rarely white; sepals 5, equal or unequal, basally united, the hypanthium symmetrical or asymmetrical; petals 5, linear to broad, sometimes densely pubescent; stamens 10, rarely 15 to 16, equal or with 3 shorter, thicker and curved filaments usually densely pubescent on the basal half; ovary stipitate, attached in the center of the hypanthium or along the upper side, pubescent. Fruits strongly laterally compressed, dry, 1- to 2-seeded.

Distribution. A genus of 60 to 70 species from Costa Rica to southern Brazil and Paraguay.

KEY TO *TACHIGALI* SPECIES IN NORTHERN SOUTH AMERICA

- 1a. Domatia in the leaf petioles with 2 blunt, horn-like projections, these ca. 1 cm long . . . 5. *T. bicornuta*
- 1b. Domatia absent or present; when present, cylindrical and never with horn-like projections 2
- 2a. Leaves with scattered, small (ca. 0.2 mm), stellate hairs 33. *T. melinonii*
- 2b. Leaves without scattered, stellate hairs; indument, if present, of simple hairs 3
- 3a. Petals longer than sepals, more or less spreading, readily visible in open flowers; or, if petals about as long as sepals, then petals obvious, about as wide as the sepals 33
- 3b. Petals equal to or shorter than the sepals, inconspicuous, linear or nearly so, clearly much narrower than the sepals 4
- 4a. Leaf petiole or rachis with swollen, hollow, ant-inhabited domatia 5
- 4b. Leaf petiole or rachis without ant-inhabited domatia 13
- 5a. Sepals glabrous except the ciliate margin; twigs and inflorescences fuscous-tomentulose/tomentose 19. *T. fusca*
- 5b. Sepals uniformly pubescent; indument of twigs and inflorescences variable, but never fuscous . . . 6
- 6a. Lower surface of the leaflets completely covered by the indument 7
- 6b. Lower surface of the leaflets partially covered by the indument or glabrous 11
- 7a. Leaflets 15–30 cm long, with 18 to 25 pairs of secondary veins; base of leaflets cordate, symmetrical 17. *T. ferruginea*
- 7b. Leaflets to 20 cm long, with 6 to 15 pairs of secondary veins; base of leaflets obtuse to acute, symmetrical or oblique 8
- 8a. Indument of twigs and inflorescences consisting of erect hairs 29. *T. macbridei*
- 8b. Indument of twigs and inflorescences consisting predominantly of appressed hairs, sometimes a few erect hairs present as well 9
- 9a. Base of leaflets asymmetrical; stipules pectinate or foliose, flat 10
- 9b. Base of leaflets symmetrical; stipules small, entire, strongly revolute 52. *T. vaupesiana*
- 10a. Stipules pectinate; domatia more than 4 cm from base of leaf, 2–4 cm long; mostly trees of terra firme forest 12. *T. chrysophylla*
- 10b. Stipules foliose, flat; domatia ca. 1 cm from base of leaf, 1–2 cm long; trees of flooded forest or river's edge 40. *T. physophora*
- 11a. Inflorescences and leaf rachises glabrous or nearly so; base of leaflets asymmetrical; domatia usually longitudinally ridged . . . 40. *T. physophora*
- 11b. Inflorescences and leaf rachises densely puberulous; base of leaflets symmetrical; domatia smooth, not longitudinally ridged 12

12a.	Leaflets to 4 cm wide; lower surface of leaflets glabrous or very sparsely appressed pubescent; trees of flooded forest	36.	<i>T. odoratissima</i>
12b.	Leaflets 6–11 cm wide; lower surface of leaflets with scattered erect hairs; trees of non-flooded forest	10.	<i>T. cenepensis</i>
13a.	Sepals glabrous, at least on the distal half	14	
13b.	Sepals uniformly and usually densely pubescent . . .	16	
14a.	Lower surface of leaflets rather densely pubescent, the hairs ferruginous, erect	34.	<i>T. micrantha</i>
14b.	Lower surface of leaflets glabrous or nearly so . . .	15	
15a.	Leaflets oblong to oblong-obovate, the margin often recurved; sepals 1–1.5 mm long; petals about half as long as sepals, broad, glabrous	35.	<i>T. micropetala</i>
15b.	Leaflets elliptic to elliptic-ovate, the margin flat; sepals 2–2.5 mm long; petals about as long as the sepals, filiform to narrowly spatulate, pubescent	26.	<i>T. leiocalyx</i>
16a.	Lower surface of leaflets moderately to densely pubescent with whitish hairs, these seemingly radiating from a central point in various directions	50.	<i>T. setifera</i> s. str.
16b.	Lower surface of leaflets without hairs radiating from a central point	17	
17a.	Lower surface of leaflets glabrous to moderately pubescent, the surface always partially or entirely visible	18	
17b.	Lower surface of leaflets completely covered by the indument, this varying from sericeous to tomentulose	26	
18a.	Indument on twigs, leaves, and inflorescences pilose, consisting of erect hairs, these sparse or moderately dense	19	
18b.	Indument, when present, appressed	20	
19a.	Base of leaflets asymmetrical; stipules pectinate, the segments flat, linear; petals linear, glabrous	23.	<i>T. guianensis</i>
19b.	Base of leaflets symmetrical; stipules 1- to 3-foliose, the segments revolute; petals linear, distally densely yellow pubescent	50.	<i>T. setifera</i> s.l.
20a.	Lower surface of leaflets with dark brown scurf or minute scales (ca. 0.1 mm), this varying from dense to sparse; individual hairs not visible . . .	50.	<i>T. setifera</i> s.l.
20b.	Lower surface of leaflets glabrous or variously pubescent, but never with dark brown scurf; if pubescent, individual hairs visible under a dissecting scope	21	
21a.	Petals pubescent; base of leaflets symmetrical or asymmetrical	22	
21b.	Petals glabrous; base of leaflets asymmetrical . . .	25	
22a.	Petals white pubescent	38.	<i>T. paraensis</i>
22b.	Petals yellow pubescent	23	
23a.	Stipules caducous; small (to 5 mm), entire, stalked, strongly revolute bracts sometimes present in the inflorescences; base of leaflets cuneate	32.	<i>T. melanocarpa</i>
23b.	Stipules foliose, sessile, often more than 1 cm long and wide, persistent; entire, strongly revolute bracts lacking; base of leaflets obtuse	24	
24a.	Base of leaflets symmetrical or slightly asymmetrical; secondary veins 8 to 11 pairs; young leaflets with some appressed hairs	25.	<i>T. inconspicua</i>
24b.	Base of leaflets asymmetrical; secondary veins 5 to 7 pairs; young leaflets silky pubescent on the lower surface	2.	<i>T. amplifolia</i>
25a.	Flowers pedicellate	54.	<i>T. vulgaris</i>
25b.	Flowers sessile or nearly so	51.	<i>T. tinctoria</i>
26a.	Indument on young twigs and leaf rachis predominantly erect	27	
26b.	Indument on young twigs and leaf rachis appressed	28	
27a.	Leaflets oblong to oblong-ovate, 2 to 3× longer than wide; petals pilose; floral bracts not longer than mature buds	44.	<i>T. prancei</i>
27b.	Leaflets broadly elliptic to elliptic-obovate, up to 2× longer than wide, or if 2× as wide as long, then leaflets less than 10 cm long; petals glabrous; floral bracts much longer than mature buds	6.	<i>T. bracteosa</i>
28a.	Tips of leaflets obtuse to rounded	41.	<i>T. pimichinensis</i>
28b.	Tips of leaflets acute or acuminate	29	
29a.	Petals pilose	30	
29b.	Petals glabrous	32	
30a.	Stipules flat, 3-foliose or entire; trees from flooded forest	24.	<i>T. hypoleuca</i>
30b.	Stipules strongly revolute, entire; trees from terra firme forest	31	
31a.	Leaflets elliptic; secondary veins 6 to 10 on each side; tertiary venation immersed, not visible	16.	<i>T. eriopetala</i>
31b.	Leaflets oblong; secondary veins 14 to 20 on each side; tertiary venation raised, visible on the lower surface of the leaflets	11.	<i>T. chrysalooides</i>
32a.	Base of leaflets symmetrical; floral bracts twice as long as the floral buds; flowers sessile	21.	<i>T. goeldiana</i>
32b.	Base of leaflets asymmetrical; floral bracts caducous, not present at base of larger buds; flowers pedicellate	39.	<i>T. peruviana</i>
33a.	Trees from the Pacific lowlands in Colombia	13.	<i>T. colombiana</i>
33b.	Trees or shrubs east of the Andes	34	
34a.	Sepals with a fringe of hairs along the margin, otherwise glabrous	30.	<i>T. macropetala</i>
34b.	Sepals uniformly and densely pubescent	35	
35a.	Indument on inflorescences and flower buds very dark brown; hypanthium in young fruits ca. 1 cm long	27.	<i>T. longiflora</i>
35b.	Indument on inflorescences and flower buds light brown or grey-brown; hypanthium in young fruits less than 7 mm long, usually less than 5 mm long	36	
36a.	Secondary veins of each leaflet 2 to 3 pairs	37	
36b.	Secondary veins of each leaflet 5 or more pairs . . .	38	
37a.	Stamens dimorphic; petals 5–6 mm long; long stamens 10–12 mm long	45.	<i>T. ptychophysca</i>
37b.	Stamens monomorphic; petals ca. 3 mm long; stamens ca. 5 mm long	28.	<i>T. loretensis</i>

38a. Lower surface of leaflets densely appressed pubescent to sericeous; sometimes erect hairs present as well 39

38b. Lower surface of leaflets sparsely pubescent or glabrous 46

39a. Domatia absent; hairs on inflorescences and leaf axes partly erect 46. *T. pubiflora*

39b. Domatia present; hairs on inflorescences and leaf axes appressed or erect 40

40a. Hairs on inflorescences and leaf axes erect or ascending 41

40b. Hairs on inflorescences and leaf axes strictly appressed 42

41a. Stamens monomorphic, 4–6 mm long; stipules 2–5 cm long, to 3 cm wide, foliose, entire or with one basal lobe 22. *T. grandistipulata*

41b. Stamens dimorphic, the longer ones 1–2 cm long; stipules often lacking, when present up to 2 × 0.5 cm 48. *T. rigida*

42a. Stamens monomorphic; petals ca. 4 mm long; domatia terete in cross section 43

42b. Stamens dimorphic; petals 5–7 mm long; domatia semiterete in cross section 44

43a. Inner surface of the petals pubescent for at least 1/5 of their length; only known from the lower Rio Negro, Parana de Anavilhana . . . 3. *T. argyrophylla*

43b. Inner surface of the petals with a few hairs near the base; mostly from Pará, few collections from Amapá, Roraima, and Guyana 20. *T. glauca*

44a. Flowers sessile or nearly so, a distinct pedicel lacking; stipules with filiform segments 53. *T. venusta*

44b. Flowers with a distinct pedicel, 3–4 mm long; segments of stipules narrowly to broadly ovate, widest in the middle 45

45a. Hypanthium distinctly asymmetrical; along Rio Vaupes and tributaries in Brazil and Colombia and around Iquitos, Peru 9. *T. cavipes*

45b. Hypanthium slightly asymmetrical; lower Rio Negro, downstream from Rio Jauaperi 12. *T. plumbea*

46a. Diameter of flowers ca. 5 mm; stamens monomorphic 47

46b. Diameter of flowers 10 mm or more (rarely only 8 mm); stamens dimorphic 53

47a. Leaves with 10 or more pairs of leaflets 48

47b. Leaves with up to 6 pairs of leaflets 50

48a. Inner surface of the petals densely pubescent with long hairs, the hairs extending beyond the margins of the petals; inflorescences ca. 30 cm, with longitudinal ridges due to the decurrent bases of the flowers 7. *T. candelabrum*

48b. Inner surface of the petals pubescent, but hairs not extending beyond the margins; inflorescences terete, rarely exceeding 20 cm, not longitudinally ridged 49

49a. Hairs on calyx appressed, grey-brown; hypanthium asymmetrical 43. *T. poeppigiana*

49b. Hairs on calyx minute, ascending to erect, medium brown; hypanthium symmetrical or nearly so 19. *T. schultesiana*

50a. Domatia semiterete; petals densely yellow pubescent on the inner surface, the hairs long and extending beyond the margin of the petals 18. *T. formicarum*

50b. Domatia cylindrical or lacking; petals sparsely pubescent on the inner surface, the hairs not extending beyond the margin of the petals 51

51a. Domatia lacking; inflorescences and flowers densely reddish brown pubescent . . . 14. *T. davidsei*

51b. Domatia present; inflorescences and flowers densely brown puberulous or moderately to sparsely pubescent 52

52a. Inflorescences and flower buds densely puberulous and completely covered by indument; inner surface of the petals pubescent, the hairs covering about 3/4 of the surface 28. *T. loretensis*

52b. Inflorescences and flower buds moderately to sparsely pubescent, the surface always partially visible; inner surface of petals with a few hairs near the base, otherwise glabrous 15. *T. dwyeri*

53a. Base of leaflets cordate; margin of leaflets revolute; leaflets bullate; stamens 15 or more 31. *T. macrostachya*

53b. Base of leaflets obtuse to cuneate; margin of leaflets not revolute; leaflets plane; stamens 10 54

54a. Leaves with 3 (rarely 4) pairs of leaflets; leaflets twice as long as wide; domatia present 8. *T. catingae*

54b. Leaves with more than 5 pairs of leaflets; leaflets more than twice as long as wide; domatia present or absent 55

55a. Leaf rachis sharply triangular; domatia present or absent 37. *T. paniculata*

55b. Leaf rachis terete or nearly so; domatia absent . . . 56

56a. Stamens monomorphic; secondary veins 8 to 10, often slightly impressed on the upper surface 1. *T. alba*

56b. Stamens dimorphic; secondary veins 4 to 8, immersed on the upper surface 57

57a. Stipules caducous; lower surface of leaflets sparsely to moderately appressed pubescent, not gland-dotted 47. *T. richardiana*

57b. Stipules persistent, foliose; lower surface of leaflets glabrous, densely gland-dotted 4. *T. barnebyi*

1. *Tachigali alba* Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 92, 1922, *Tachigali paniculata* var. *alba* (Ducke) Dwyer, Ann. Missouri Bot. Gard. 41: 240, 1954. TYPE: Brazil, Pará: “prope Gurupa,” Ducke s.n. (MG 17227) (lectotype, designated here, MG not seen, photo F!; duplicates, BM!, G not seen, photo F!, P!).

Discussion. *Tachigali alba* is a tall (30–40 m) tree from terra firme forests. Domatia are lacking, stamens are monomorphic, stipules are caducous and have not been seen. Leaflets have an asymmetrical base, are generally oblong with slightly impressed lateral veins on the upper surface. The leaf rachis is terete or nearly so. Flowers are smaller than in *T. paniculata*, with petals 4–4.5 mm and sepals 4 mm. The ultimate

divisions of the inflorescences are rather loosely flowered and linear, while in the similar *T. paniculata* the flowers are more compactly clustered and the flower-bearing part is narrowly pyramidal, clearly wider at the base than at the apex. *Tachigali alba* is morphologically close to *T. richardiana*; differences are the dimorphic stamens in *T. richardiana*, fewer pairs of lateral veins (8 to 10 in *T. alba*, 4 to 7 in *T. richardiana*), and the presence of a patch of hairs near the base on the outer surface of the petals, while the outer surface of the petals is glabrous in *T. alba*.

To prevent nomenclatural ambiguity, the collection *Ducke s.n.* (MG 17227) in MG has been designated as lectotype. The other syntypes are *Ducke s.n.* (MG 17075) and *Ducke s.n.* (MG 17110); duplicates of these collections have been seen in BM and represent *Tachigali alba*.

Distribution. *Tachigali alba* is known from Amapá, Amazonas, and Pará in Brazil and a single collection from Guyana.

Selected specimens examined. BRAZIL. **Amapá:** Pires *et al.* 51242 (F, GH, IAN, MG, US). **Amazonas:** Manaus, *Ducke* 932 (F, MG, R, RB, US). **Pará:** Rio Pracupi, *Froes* 32856 (IAN, US). GUYANA. Rewa River, at Great Falls, *Clarke* 6563 (K).

2. *Tachigali amplifolia* (Ducke) Barneby, *Brittonia* 48: 182. 1996. Basionym: *Sclerolobium amplifolium* Ducke, *Arq. Inst. Biol. Veg.* 2: 43. 1935. TYPE: Brazil. Amazonas: “prope São Paulo de Olivença, silva non inundabili.” A. *Ducke s.n.* (RB 24295) (holotype, RB not seen; isotypes, K!, P!, US!).

Discussion. According to the original description, this species is recognized by its large leaflets that are densely pubescent; linear petals; large and persistent, foliose stipules; and lack of domatia. The description from Ducke (1935) also mentioned that the leaflets were silky pubescent and golden-shiny, but these characteristics are restricted to young leaflets. Petals are pubescent on the upper half. Leaflets have an asymmetrical base. Four collections have been seen from western Brazil (Acre, Amazonas, Rondônia) and several from Guyana, French Guiana, and Suriname. The collections from the Guianas have larger leaflets (to 25 × 11 cm) and longer floral bracts than the collections from western Brazil. When recorded on field labels, habitat is given as forest on terra firme. Good flowering material of *Tachigali amplifolia* has not been seen from Guyana, French Guiana, or Suriname in this study, and it is not certain if the specimens from the Guianas should be included in *T. amplifolia*. The flowers of the specimens from western Brazil have relatively long sepals in relation to the hypanthium, and the sepals are rather narrow and do not overlap.

Selected specimens examined. BRAZIL. **Acre:** Mun. Mancio Lima, *Cid Ferreira et al.* 10026 (INPA, NY). **Amazonas:** São Paulo de Olivença, *Krukoff* 8879 (F, MO, NY, US). **Rondônia:** 30 km E of Rondônia en route to Vilhena, *Maguire et al.* 56799 (COL, F, NY, US). FRENCH GUIANA. Haut Camopi, *Sabatier* 1546 (MO, NY). SURINAME. Wilhelmina Gebergte, *Irwin et al.* 55597 (GH, NY).

3. *Tachigali argyrophylla* Ducke, *Bol. Tecn. Inst. Agron. N.* 2: 14. 1944. TYPE: Brazil. Amazonas: Parana de Anavilhana, *Ducke* 936 (holotype, RB not seen; isotypes, INPA!, K!, MO!, R!, US!).

Discussion. Characteristic of the species is the combination of the sericeous lower surface of the leaflets, terete domatia, and rather small, broad petals (4 mm long) with a pubescent inner surface. The base of the leaflets is asymmetrical. Stamens are monomorphic. Stipules are unknown. This species is currently known from the type collection from the lower Rio Negro in terra firme forest and possibly a second collection from Loreto, Peru. It is surprising that more collections of this species do not exist, because the lower Rio Negro is relatively well collected. A collection from the Jenaro Herrera in Peru (*Spichiger* 4686) is tentatively placed here; it keys to *Tachigali argyrophylla* based on flower size, monomorphic stamens, indument on the inner surface of petals, terete domatia, and sericeous lower surface of leaflets. This is an unusual disjunct distribution. Dwyer (1954) listed *Ducke* 936 and 937 as syntypes. This is an error, since Ducke only mentioned *Ducke* 936 when he described this species.

4. *Tachigali barnebyi* van der Werff, sp. nov. TYPE: Brazil. Rondônia: basin of Rio Madeira, margin of Mutumparaná airstrip, 25 Nov. 1968, *G. T. Prance, W. A. Rodrigues, J. F. Ramos & L. G. Farias* 8844 (holotype, INPA!; isotypes, COL!, F!, GH!, MG!, R!). Figure 3.

Tachigali richardianae Tul. similis, sed ab ea stipulis persistentibus, foliolis subtus glabris punctatisque et petalis extus glabris recedit.

Tree, to 25 m; twigs terete, minutely puberulous, glabrescent; stipules foliose, gland-dotted on the lower surface, with a large terminal lobe (1.5–2.5 × 1–1.5 cm) and 1 or 2 small (4–5 × 2–3 mm) lateral lobes, the lobes with a short (1–2 mm) stalk. Leaf rachis 7–13 cm, terete, minutely puberulous, domatia lacking; leaflets 4 to 5 pairs, oblong to ovate-oblong, 7–10 × 2–3 cm, glabrous, gland-dotted on the lower surface, the base obtuse, symmetrical or nearly so, the apex acute; secondary veins 7 to 8 pairs per leaflet, immersed and poorly visible. Inflorescences 10–20 cm, densely brown puberulous. Flower buds



Figure 3. *Tachigali barnebyi* (isotype).

densely pubescent; bracteoles 4–5 mm, 1/2 to 1/3 the length of mature buds; pedicels of open flowers ca. 5 mm, hypanthium oblique, sepals 5–7 × ca. 4 mm, puberulous on the outer surface, pubescent on the inner surface, spreading to reflexed; petals similar in size and shape to the sepals, glabrous on the outer surface and pubescent on the inner surface, spreading to reflexed; stamens 10, dimorphic, 7 longer stamens ca. 1.2 cm, 3 shorter, ca. 8 mm, all pubescent on the lower 4 mm; pistil ca. 1.2 cm, ovary ca. 5 mm, densely pubescent, the style ca. 7 mm, becoming sparsely pubescent toward the stigma; stigma entire or with 2 short lobes. Immature fruits ca. 1 cm, densely pubescent; mature fruits not seen.

Discussion. *Tachigali barnebyi* shares with *T. richardiana* terete petioles, lack of domatia, and large flowers with dimorphic stamens. The terete petioles are especially rare among the species with large (4–7 × ca. 4 mm) petals. The new species differs from *T. richardiana* in its persistent stipules (caducous in *T. richardiana*) and its glabrous, gland-dotted lower surface of the leaflets (sparsely to moderately appressed pubescent and without gland dots in *T. richardiana*). Additional but weaker differences are the following: floral pedicels are longer in *T. barnebyi* (5 vs. 3 mm); the base of the leaflets is more asymmetrical in *T. richardiana*; and the leaflets of *T. barnebyi* are more coriaceous and the venation is less visible than in *T. richardiana*. The weaker differences are best seen when specimens of both species are at hand. The distribution of the two species does not overlap: *T. barnebyi* is known only from Rondônia and *T. richardiana* from French Guiana and adjacent Pará in Brazil. *Tachigali alba* also has terete petioles, has showy petals, and lacks domatia. However, it has caducous stipules, smaller petals (4–4.5 mm), monomorphic stamens, and slightly impressed secondary veins. According to the label of the type collection, isotypes have also been deposited in NY, K, S, U, and P.

Etymology. It is a pleasure to name this species after the late Rupert Barneby (1911–2000), who was truly a scholar and a gentleman and contributed so much to our understanding of Neotropical Leguminosae.

IUCN Red List category. *Tachigali barnebyi* is known from three collections in a poorly known part of the Amazonian rainforest and is therefore listed as Data Deficient (DD) (IUCN, 2001).

Paratypes. BRAZIL. **Rondônia:** Rodovia RO-399, a 13 km de Vilhena, M. G. Vieira, R. H. Petersen, B. W. Nelson, J. F. Ramos & C. D. A. Mota 910 (INPA, MG, MO, US); Porto Velho, Rio Jamari, U. N. Maciel & C. S. Rosario 1722 (MG).

5. *Tachigali bicornuta* van der Werff, sp. nov.

TYPE: Peru. Amazonas: Bagua Province, distr. Imaza, comunidad Aguaruna de Wanas, cerros Chinim, 800–850 m, 31 Aug. 1996, C. Diaz, A. Peña, L. Tsamajain & M. Roca 8100 (holotype, HUT not seen; isotype, MO!). Figure 4.

A congeneris domatiis petiolaribus bicornutis et ramulis terminalibus infructescentiarum inflatis recedit.

Trees, 12 m; twigs terete or slightly angular, glabrous. Leaves ca. 50 cm, with 6 to 10 pairs of leaflets, rachis ± round, minutely puberulous, the hairs ca. 0.1 mm, erect, not visible with the unaided eye; a domatium present ca. 5 cm from the base of the leaf, this shaped as 2 blunt horns ca. 1 cm and with a round tip, a pair of small (ca. 6 × 3 cm) leaflets attached to the sinus between the 2 horns of the domatium; leaflets narrowly elliptic, 12–20 × 3.5–4.5 cm, the base obtuse, somewhat asymmetrical, the apex tapering to a sharp point, the lamina gland-dotted on the lower surface, glabrous, midrib and secondary veins minutely puberulous as on the rachis, secondary veins 8 to 11 pairs per leaflet, petiolules 3–5 mm; detached stipules ca. 3 cm long, with 3 pairs of lanceolate segments, these 1.5–2 cm × 2–5 mm. Flowers and inflorescences unknown. Detached infructescences ca. 25 cm, densely and minutely puberulous, 1- or 2-branched, base of infructescence solid, 3–6 mm diam., ultimate branches of infructescences 8–18 cm, distally swollen and hollow, ca. 1 cm diam., with 1 or 2 perforations near the base; calyx cup ± symmetrical, not strongly oblique; fruits strongly laterally compressed, ca. 5 × 2 cm, the margin papyraceous, 1-seeded.

Discussion. The new species *Tachigali bicornuta* can be easily recognized by the peculiar domatia on the leaf petioles, the finger-like inflated terminal branches of the infructescences, and the minute, erect indument on leaf rachis, the main veins of the leaflets, and the infructescences. According to the label information of the type collection, the petiolar domatia are occupied by fierce ants. A collection from Brazil, Acre, Serra do Moa (Cid Ferreira et al. 5105, INPA, MEL, MO, NY) has similarly inflated terminal branches of the inflorescences, which are 1–1.5 cm diam. This collection differs in several characters from the new species described here and is not placed in *T. bicornuta*. Its domatia are much longer than wide (ca. 5 × 1.5 cm) and are flattened on the upper surface of the rachis, much as in *T. formicarum*; its leaflets are glabrous and lack the minute puberulous indument on the main veins; the leaflets are larger and wider (up to 28 × 10 cm); and the indument on the inflorescences is appressed, not

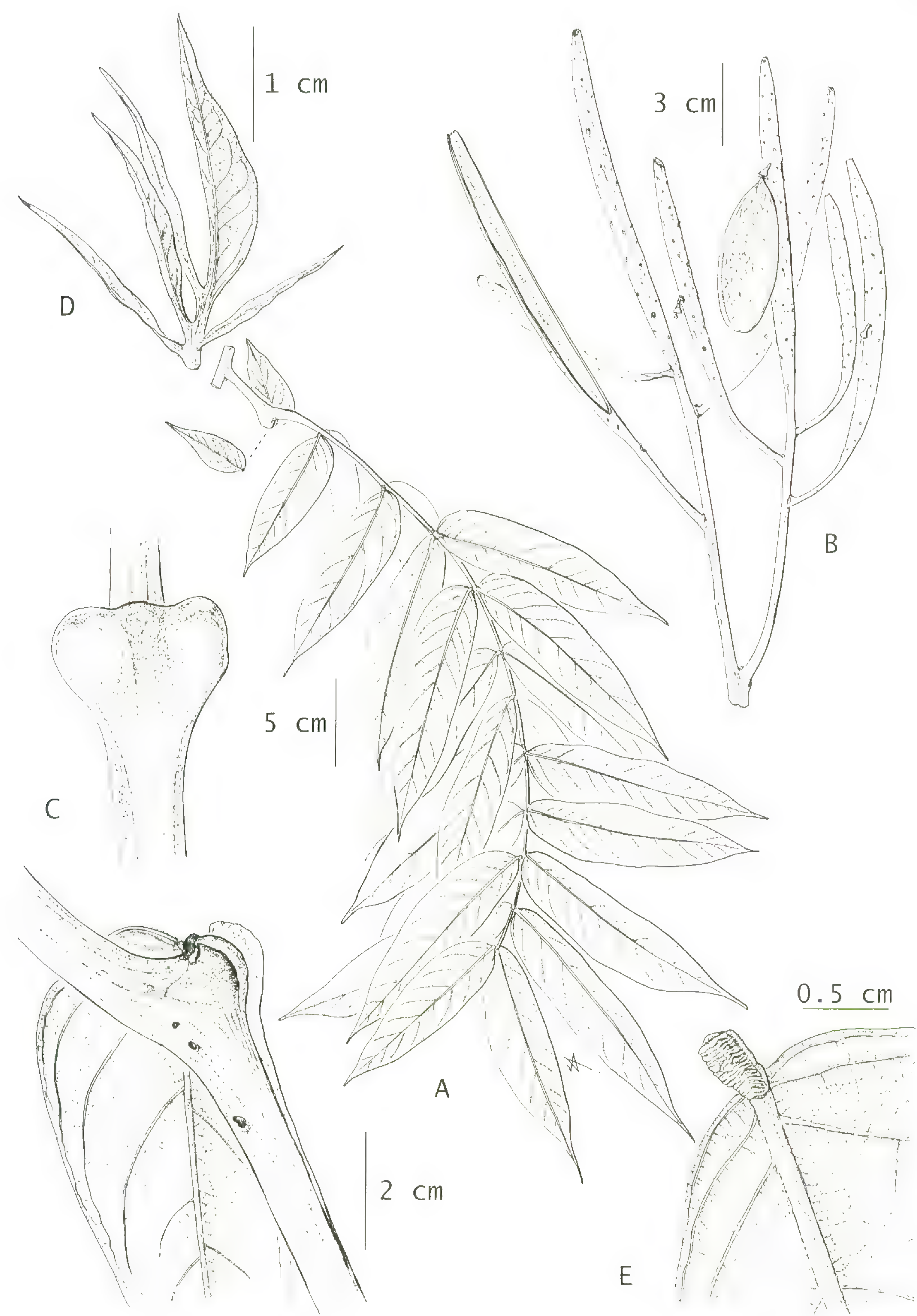


Figure 4. *Tachigali bicornuta* (Díaz, Peña, Tsamajain & Roca 8100, MO). —A. Leaf. —B. Infructescence. —C. Domatia, dorsal view (top) and lateral view (bottom). —D. Stipule. —E. Base of leaflet.

puberulous or minutely erect. The hypanthium at the base of the mature fruits is symmetrical. Apart from the thickened terminal branches of the inflorescence, the collection agrees quite well with *T. formicarum*.

IUCN Red List category. *Tachigali bicornuta* has been collected once in a botanically poorly known region of Peru and is listed as Data Deficient (DD) (IUCN, 2001).

- 6. *Tachigali bracteosa*** (Harms) Zarucchi & Pipoly, Sida 16: 411. 1995. Basionym: *Sclerolobium bracteosum* Harms, Bot. Jahrb. Syst. 40: 169. 1907. TYPE: Brazil. Amazonas: Cachoeiras des Marmellos, *Ule 6094* (holotype, B†; isotypes, K!, L!).

Sclerolobium froesii Pires, Bol. Tecn. Inst. Agron. N. 38: 23. 1960. *Tachigali froesii* (Pires) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 399. 2007. Syn. nov. TYPE: Brazil. Amazonas: Rio Canuma, *Froes 33744* (holotype, IAN not seen; isotype, RB not seen).

Discussion. *Tachigali bracteosa* has broadly elliptic to obovate leaflets, tomentulose on the lower surface, long bracts subtending the buds, and glabrous, linear petals. Domatia are lacking. Stipules of this species have not been seen in this study. The base of the leaflets is rounded to cordate. Only a photograph of the type of *Sclerolobium froesii* (in Pires, 1960) has been seen. The photograph and description leave no doubt that *S. froesii* is a synonym of *T. bracteosa*. Dwyer (1957a) cited *Macedo 4063* (MO, US) from the state of Pará under *S. bracteosum*; however, these specimens lack the tomentulose indument on the lower surface of the leaflets. In shape and size, the leaflets agree with *T. bracteosa*. It is possible that these fruiting specimens represent an undescribed species closely related to *T. bracteosa*. The US specimen of *Macedo 4063* has pectinate stipules.

Distribution. *Tachigali bracteosa* has been reported from flooded forest or riverbanks in Brazil (Amazonas, Mato Grosso, Tocantins) and Bolivia.

Selected specimens examined. BOLIVIA. **Beni:** Prov. Yacuma, *Beck & de Michel 20919* (NY). **Santa Cruz:** Parque Noel Kempff, *Quevedo et al. 2585* (NY). BRAZIL. **Amazonas:** Mun. Axinim, *Zarucchi et al. 2922* (INPA, MG). **Mato Grosso:** 1/2 km N of Rio Suia–Missu Ferry, *Ratter et al. 1383* (IAN, NY). **Tocantins:** Mun. Lagoa da Confusão, *Mendonça et al. 3962* (MO).

- 7. *Tachigali candelabrum*** van der Werff, sp. nov. TYPE: Brazil. Amazonas: Mun. de Manicore, Rod. Transamazonica Km 302, Rio Aripuena entre a Rod. e a Cachoeira Matamata, 24 Apr. 1985, *Cid Ferreira 5780* (holotype, INPA! [2

sheets]; isotypes, MEL!, MG!, MO!, NY!). Figures 5 and 6.

Tachigali poeppigiana Tul. similis, sed ab ea lobis stipularum linearibus, petalis intus dense longeque pubescentibus, inflorescentiis majoribus, racemis porcatis et domatiis semiteretibus recedit.

Trees, to 12 m; twigs terete or slightly angled, smooth, glabrous; stipules 1–1.5 cm, pinnate, with 3 pairs of linear segments, these ca. 1 mm wide, glabrous or with a few scattered hairs. Leaves 25–40 cm, with 10 to 15 pairs or leaflets, the leaf axis sharply angled, glabrous or with some appressed hairs, leaflets in middle of the leaves 10–15 × 3–4 cm, often conduplicate, basal leaflets smaller, ca. 5 × 2.5 cm, leaflets glabrous, the base strongly asymmetrical, the larger lobe auriculate, the tip acute; secondary veins 6 to 8 pairs on each leaflet, inconspicuous, tertiary venation raised on the lower surface, immersed on the upper surface; domatia 2–3 cm, semiterete, not strongly thickened, distally with a pair of scars from fallen leaflets. Inflorescences paniculate, 30–40 cm, sparsely appressed pubescent near the base, the terminal racemes 20–25 cm, densely appressed pubescent and with pronounced ridges from the decurrent bases of the flowers; bracteoles ca. 5 mm, densely pubescent, linear; flowers yellow, densely and minutely appressed pubescent; pedicels 1–2 mm; sepals 2–3 mm, ovate-elliptic, densely pubescent on the outer surface, sparsely pubescent on the inner surface; petals slightly longer and narrower than the sepals, glabrous on the outer surface and pubescent on the inner surface, sometimes densely so toward the tip; stamens ca. 10, monomorphic, united at the base, 4–5 mm, pubescent on the lower half, ovary ca. 3 mm, densely and uniformly pubescent, the stalk ca. 1 mm; hypanthium asymmetrical, but ovary inserted at the base of the cup, with the stipe appressed against the lower side. Fruits not known.

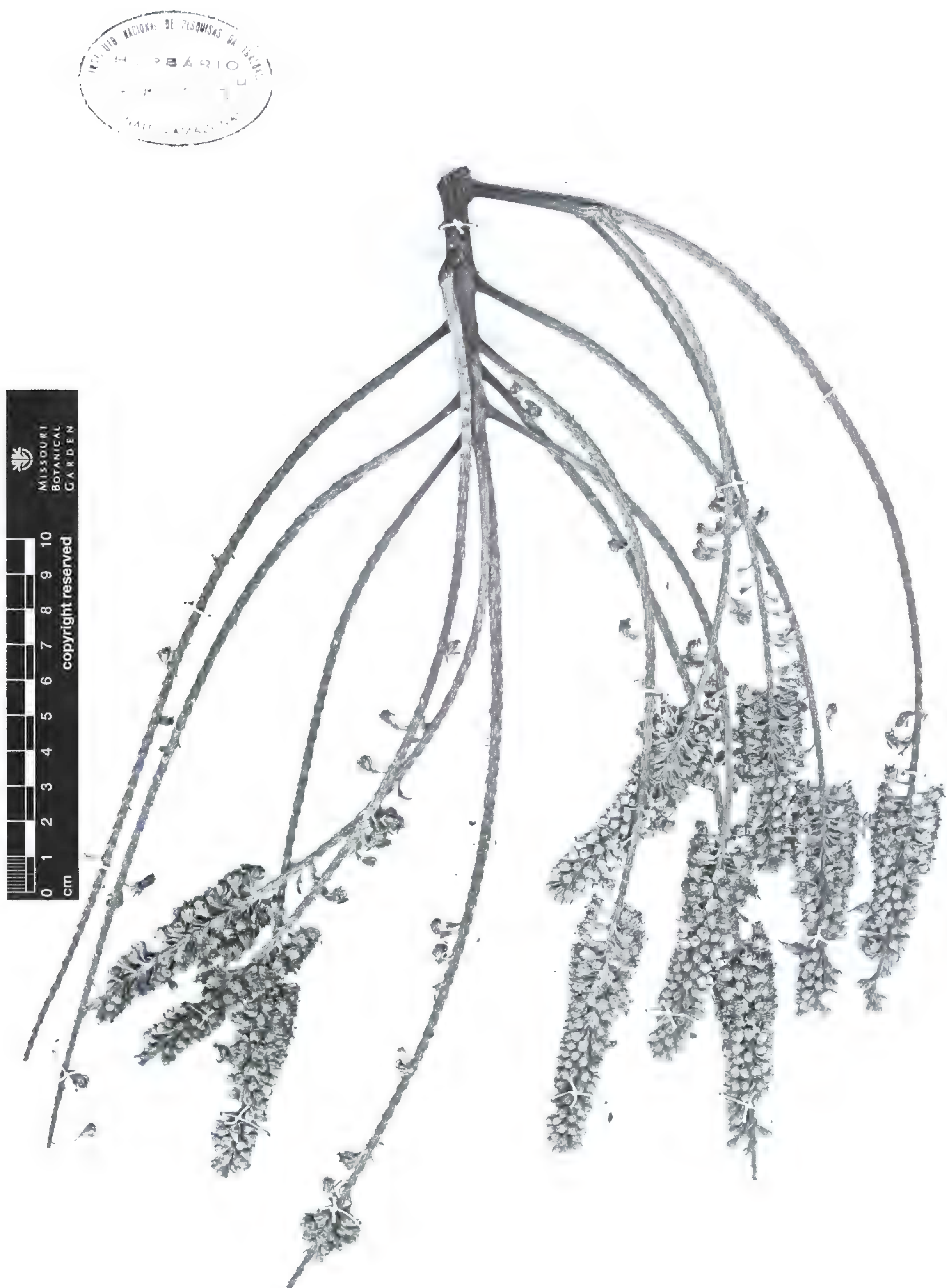
Discussion. *Tachigali candelabrum* can be recognized by the leaves with many pairs of leaflets; the sharply angled leaf rachises; the dense pubescence on the inner surface of the broad petals, especially on the distal half; and the many ridges on the terminal racemes formed by the decurrent bases of the flowers. The long, upward-arching racemes give the impression of a candelabrum, and the chosen epithet “candelabrum” is a noun in apposition. *Tachigali poeppigiana* and *T. schultesiana* are the only other species of *Tachigali* with 10 or more pairs of leaflets. They differ in having terete domatia and foliose stipules and stamens, which are only pubescent near their base. *Tachigali candelabrum* is only known from three collections in southern



Tachigali candelabrum van der Werff
Holotype
Determined by: Henk van der Werff, 2007

PROJETO FLORA AMAZÔNICA
Excursão à Rodovia Transamazônica - 1985
INPA Nº 127.244 CAES.
chigalia
Estado do Amazonas, Município Maricopa, BR 230.
Rod. Transamazônica km 302. R. A. - 300 m, entre a Rod. e a Cachoeira Matarata. 3° 35' S, 60° 40' W. Mata de igapó, solo arg. úmido.
Árvore de 12m x 10cm de diâm., flores amarelas, botões esverdeados. N.V: "Taxi".
C.A. Cid Ferreira Nº 5780 24/IV/85
CONVÊNIO CNPQ/USF (CNPQ - NEW YORK BOTANICAL GARDEN). MEMBROS DA EXCURSÃO: C.A. CID FERREIRA, O.A. DA SILVA, V.F. RODRIGUES, A. HENDERSON, F. RICHSON, D. PARKER, J.L. DOS SANTOS E J.A.

Figure 5. *Tachigali candelabrum* (holotype, leaf).



Tachigali candelabrum van der Werff
Determined by: Henk van der Werff, 2007

Figure 6. *Tachigali candelabrum* (holotype, inflorescence).

Amazonas, east of Humaitá. One collection came from terra firme forest, one from igapo, and the third had no habitat information on the collection label.

The holotype consists of two sheets, one with a leaf, the other with an inflorescence. Both sheets have the same INPA herbarium number and form a single specimen.

IUCN Red List category. *Tachigali candelabrum* is only known from three collections. Without further information, it is best listed as Data Deficient (DD) (IUCN, 2001).

Paratypes. BRAZIL. **Amazonas:** Mun. de Humaitá, Rod. Transamazônica a 113 km de Humaitá, fl., *Cid Ferreira* 5487 (INPA, MEL, MO, NY); 300 km E of Humaitá along Transamazônica Hwy., fl., *Cid Ferreira* 5925 (MO, NY).

8. *Tachigali catinae* Ducke, Arq. Inst. Biol. Veg. 1: 12, 1938. TYPE: Brazil, Amazonas: *Ducke s.n.* (RB 35421) (holotype, RB not seen; isotypes, K!, P!, US!).

Discussion. *Tachigali catinae* can be recognized by the combination of glabrous leaves and twigs, while the inflorescences are rufous-brown tomentose or tomentulose; its leaflets are 3 to 4 pairs and 5–10 cm wide, stamens are dimorphic. Domatia are present, semiterete, and stipules are foliose with 1 pair of lateral lobes; the terminal lobe is ca. 2 cm long. Petals are elliptic to obovate, ca. 2 mm wide. The distal leaflets have a symmetrical, obtuse base. This species has relatively broad leaflets. The lower surface of the leaflets is densely gland-dotted, a character otherwise only seen in *T. barnebyi* and *T. bicornuta*.

Distribution. *Tachigali catinae* is known only from the type collection from the upper Rio Curicuriary and two sterile collections from the upper Rio Negro and the Rio Uaupes. As the name indicates, it occurs in caatinga forest.

Additional specimens examined. BRAZIL. **Amazonas:** Taracua, Rio Uaupes, *Pires et al.* 7512 (IAN); Upper Rio Negro, Taracua, *Rodrigues* 1141 (INPA).

9. *Tachigali cavipes* (Benth.) J. F. MacBr., Field Mus. Nat. Hist., Bot. Ser., 13: 127, 1943. *Tachigali paniculata* var. *cavipes* Benth., Fl. Bras. 15: 229, 1870. TYPE: Brazil, "prope Panure ad Rio Uaupes," *Spruce* 2553 (holotype, K!; isotype, P!).

Discussion. This species is very similar to *Tachigali plumbea* Ducke; the only difference is the distinctly asymmetrical hypanthium in *T. cavipes* versus the slightly asymmetrical hypanthium in *T. plumbea*. The distributions of the two species do not overlap: *T. cavipes* is known from the Rio Vaupes and

tributaries in Brazil and Colombia, one collection from the Río Guinía in Venezuela and a few collections around Iquitos in Peru, while *T. plumbea* occurs downstream along the Rio Negro and Rio Amazon. Petals are to 3 mm wide. Both species have semiterete domatia, sericeous leaflets, foliose stipules, and dimorphic stamens. *Tachigali glauca* Tul. and *T. venusta* Dwyer are also similar; *T. glauca* differs in its more erect or ascending indument on inflorescences and flowers and its monomorphic stamens, and *T. venusta* differs in its pectinate stipules and sessile flowers.

Selected specimens examined. BRAZIL. **Amazonas:** Rio Tiquié, affluent of Rio Uaupes, *Kawasaki* 225 (INPA, MO). COLOMBIA. **Amazonas:** Rio Miritiparana, *Schultes & Cabrera* 16463 (GH, US). **Vaupes:** Rio Piraparana, *Davis* 119 (GH). PERU. **Loreto:** Jenaro Herrera, *van der Werff & Vasquez* 9989 (MO). VENEZUELA. **Amazonas:** Rio Guinía, *Maguire et al.* 41769 (F, GH, IAN, MO, US).

10. *Tachigali cenepensis* van der Werff, sp. nov. TYPE: Peru, Amazonas: "Quebrada chichijam entsa," 1100 ft., 24 Apr. 1973, *Ernesto Ancuash* 291 (holotype, MO!; isotype, US!). Figure 7.

Quoad domatia longa *Tachigali chrysophyllae* (Poepp.) Zarucchi & Herend. similis, sed ab ea indumento ramulorum inflorescentiarumque erecto et basi foliolorum symmetrica differt.

Tree, 20–25 m; twigs angular, 1–1.5 cm thick, densely pubescent with short, erect, straight, ferruginous hairs; stipules foliose, flat, 2- or 3-lobed, the terminal lobe the largest, 1–1.5 cm long and wide. Leaf rachis 30–40 cm, densely ferruginous puberulous, with hairs similar to those on the twigs, domatia present, 8–10 cm, cylindrical, 7–9 mm diam., 8–10 cm from the base of the rachis and above the first pair of leaflets; leaflets ca. 5 pairs, the basal pair ca. 10 × 6 cm, the distal pairs larger, to 19 × 11 cm, the base symmetrical or nearly so, obtuse to rounded or subcordate, apices not seen (damaged on the type), sparsely pubescent with short, erect hairs on the lower surface, sometimes mixed with some longer, appressed hairs, glabrous on the upper surface; secondary veins 8 to 12 pairs per leaflet, immersed on the upper surface, raised and pubescent on the lower surface. Inflorescences paniculate, 20–30 cm, densely ferruginous puberulous, the main axes with cylindrical domatia similar to those of the leaf rachises, but shorter (5–8 cm long); ultimate branches of the inflorescences not swollen. Mature flowers densely pubescent, the pedicels ca. 1 mm long, the hypanthium cup-shaped, symmetrical, ca. 2 × 3 mm, sepals 2.25 × ca. 1.5 mm, petals as long as the sepals, linear, distally densely yellow pubescent; stamens 4–5 mm, pubescent near the base, otherwise glabrous;



Figure 7. *Tachigali cenepensis* (holotype).

young fruits ca. 8 mm, pubescent with spreading, dark brown hairs; floral bracts not seen. Mature fruits not seen.

Discussion. *Tachigali cenepensis* is a very distinct species based on the combination of long, cylindrical domatia; the dense, ferruginous indument consisting of short, erect and straight hairs on twigs and inflorescences; and the sparse, erect indument on the lower surface of the leaflets. The large leaflets with an obtuse, rounded, or subcordate base are also distinct. The species keys out together with *T. odoratissima* (Benth.) Zarucchi & Herend. and *T. physophora* because of the presence of domatia, uniformly pubescent sepals, and a sparse indument on the leaflets. However, these two species are not closely related to *T. cenepensis*. They differ in having smaller, narrower leaflets, smaller domatia, and a different indument; both are species from flooded forests in Venezuela, Brazil, and Colombia. Rather long, cylindrical domatia occur in *T. chrysophylla* and *T. macbridei* Zarucchi & Herend., but these two species have glabrous petals. It is more likely that the relationship of *T. cenepensis* rests with a group of species including *T. setifera* (Ducke) Zarucchi & Herend., *T. vasquezii*, *T. chrysaloides* van der Werff, and *T. prancei* (H. S. Irwin & Arroyo) L. F. Gomes da Silva & H. C. Lima. These species share oblong leaflets with a symmetrical base, pubescent petals, and, when present, large foliose or revolute stipules. *Tachigali cenepensis* is the only species in this group with domatia. Among the sterile or fruiting collections at MO are several collections from lowland Peru that closely resemble *T. cenepensis* in size and shape of leaflets and the dense, erect indument on the twigs and leaf stalks as well as one flowering collection resembling *T. cenepensis* in leaflet characters, but with appressed indument on the lower surface of the leaflets. Other collections from the same area, the valley of the Río Palcazu in Pasco, have short, erect hairs on the lower surface of the leaflets. Domatia are absent in all these specimens. It is possible that the domatia in the type specimens of *T. cenepensis* are atypical and that the specimens without domatia, but with similar leaflets, belong to *T. cenepensis*. The specimens similar to the type of *T. cenepensis* but without domatia differ from *T. setifera* s.l. in their larger and wider leaflets and leaves, thicker leaf stalks, and the dense, ferruginous indument on twigs and leaf stalks. Additional flowering specimens are necessary in order to resolve relationships in this group. The specimens resembling *T. cenepensis* are included in the exsiccatae list as *T. aff. cenepensis*; they had been previously identified as *T. vasquezii*, *Sclerolobium*

bracteosum, and *S. rugosum* Benth. and may have been distributed under those names.

IUCN Red List category. This species is only known from the type collection. For lack of additional information, it is listed as Data Deficient (DD) (IUCN, 2001).

11. *Tachigali chrysaloides* van der Werff, sp. nov.

TYPE: Ecuador, Morona-Santiago: Cordillera de Cutucu, along Patuca-Santiago rd., 600–1000 m, 23 Oct. 1988, L. Dorr & L. Barnett 5824 (holotype, NY!; isotypes, MEL!, MO!). Figure 8.

Tachigali prancei (H. S. Irwin & Arroyo) L. F. Gomes da Silva & H. C. Lima similis, sed ab ea stipulis magnis revolutis et indumento breviori adpresso recedit; a *T. setifera* indumento sericeo et stipulis magnis diversa est.

Trees, to 30 m; twigs angular, minutely appressed pubescent; stipules entire or with one basal lobe, the main lobe or entire stipule 2–4 cm, strongly revolute, the lateral lobe when present 1–1.5 cm, also strongly revolute, appressed pubescent on the outer surface, densely so on the inner surface; the secondary veins strongly impressed and the whole structure appearing like a pupa of a butterfly. Leaf rachis 20–40 cm, terete or canaliculate on the upper surface, densely and minutely appressed pubescent, domatia lacking, leaflets 5 to 7 pairs, 11–20 × 4.5–8 cm, oblong to oblong-elliptic, the base symmetrical, rounded to subcordate, the apex acute or short-acuminate, the upper surface glabrous except for appressed pubescence on the primary and secondary veins, lower surface densely yellow-brown pubescent, the indument appressed and completely covering the surface, somewhat sericeous; secondary veins 14 to 20 pairs per leaflet, immersed on the upper surface, raised on the lower surface; tertiary veins scalariform, weakly raised on the lower surface. Inflorescences paniculate, 20–30 cm, the main axis densely appressed pubescent, the minor axes also with longer, curly hairs; pedicels 0.5–1 mm, floral bracts subulate, ca. 2 mm, densely pubescent, only present at base of young buds and quickly caducous; flowers 4–5 mm, uniformly appressed pubescent, the hypanthium ca. 1 mm long, turbinate, symmetrical, sepals ca. 3 mm, erect, the inner surface glabrous; petals linear, ca. 2 mm, densely yellow pubescent; stamens ca. 4 mm, pubescent on the lower half, distally glabrous; ovary ca. 3 mm, pubescent, the hairs stiff, brown, ascending. Fruit samaroid, ca. 15 × 3.5 cm, 1-seeded.

Discussion. *Tachigali chrysaloides* is closely related to *T. prancei* and *T. setifera*. It differs from both species by the large, revolute stipules. Stipules are generally absent in *T. prancei*; the one stipule seen



Figure 8. *Tachigali chrysaloides* (holotype).

in this study is foliose and flat. In *T. setifera*, stipules are also frequently absent; when present, they are to 1 cm long and revolute, as in *T. chrysaloides*. The indument on twigs and leaf rachises of *T. prancei* consists of short, erect hairs and is not appressed as in *T. chrysaloides*. The indument on the lower surface of the leaflets of *T. setifera* is very characteristic; it consists of short, pale, appressed hairs that radiate in all directions. Similar hairs in *T. chrysaloides* generally point in the same direction and give the leaflets a sericeous appearance. *Tachigali vasquezii*, a species known from two fruiting collections made in the Cenepa Basin in northern Peru, is also morphologically similar. It differs from *T. chrysaloides* in its indument: the lower surface of the leaflets is tomentulose, not appressed pubescent, and the midrib on the lower surface has short, erect hairs. Flowers are not yet known and stipules are not present on the two existing fruiting collections. Common names are “wantsun” (Shuar name in Ecuador) and “cano jihui” (Chacobo name in Bolivia). Some specimens had been previously annotated as *Sclerolobium chrysophyllum* Poepp., *S. rugosum*, and *T. vasquezii*, and duplicates may have been distributed under those names.

Distribution. *Tachigali chrysaloides* has been reported from the following areas: western Brazil (Acre, Mato Grosso, Rondônia), and adjacently in Bolivia, and along the eastern foothills of the Andes in Ecuador; a single collection is known from the Department of Loreto in Peru.

IUCN Red List category. The few known collections of this species are scattered over a large area, and a listing of Least Concern (LC) seems appropriate (IUCN, 2001).

Paratypes. BOLIVIA. **Beni:** prov. Vaca Díez, vic. of Chacobo village Alto Ivon, *Boom* 1237 (NY), 1307 (NY), 1458 (MG, MO, NY). BRAZIL. **Acre:** BR-317, Km 67, fl., *Rego & das C. da S. Waltir* 926 (MO); Mun. Brasiléia, Reserva Extr. Chico Mendes, *Cid et al.* 10140A (INPA); Mun. Senador Guionard, *Cid Ferreira et al.* 10265 (INPA, MO). **Mato Grosso:** Aripuena, *Monteiro, Leite, Gomes & Miranda* 1148 (INPA); same loc., *Silva & Pinheiro* 1266 (NY), *Silva & Pinheiro* 1322 (INPA, MG), *Silva & Rosario* 1309 (NY). **Rondônia:** Mun. Guajira-Mirim, Chapada dos Pacaas Novos, *Cid Ferreira* 8768 (INPA, MEL, MO). ECUADOR. **Morona-Santiago:** Bomboiza, alrededores de la Mision Salesiana, *Neill, Baker, Palacion & Cerón* 7441 (MO); Limon Indanza, valley of Rio Coangos, *Neill & Manzanares* 13212 (MO). **Zamora-Chinchipe:** Nambija, fl., *Quizhpe, Pardo, Granda & Cobos* 892 (MO); in the vic. of the mining camp at Rio Tundaime, *van der Werff, Gray, Ronquillo & Quizhpe* 19523 (MO). PERU. **Loreto:** Prov. Maynas, Rio Itaya, *Vasquez & Jaramillo* 5740 (MO).

12. *Tachigali chrysophylla* (Poepp.) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard.

15: 1254. 1993. Basionym: *Sclerolobium chrysophyllum* Poepp., Nov. Gen. Sp. Pl. 3: 60. 1845. TYPE: Brazil. *Poeppig* 2666 (holotype, W not seen; isotype, P!).

Sclerolobium sericeum Tul., Arch. Mus. Hist. Nat. 4: 125. 1844, non *Tachigali sericea* Tul. TYPE: Brazil. *Poeppig* 2666 (holotype, P!).

Discussion. *Tachigali chrysophylla* is best recognized by the combination of its domatia (these cylindrical and moderately swollen and often beyond the first pair of leaflets) and leaflets with a strongly unequal base and sericeous lower surface. Stipules, when present, are pectinate. Petals are glabrous and linear. Most collections are from terra firme forest. The majority of collections are from Peru and Venezuela, with single collections from Brazil and Ecuador. This distribution pattern suggests that other collections from Colombia and Brazil remain unidentified or are misidentified. It is also possible that more than one species is filed under this name; the specimens are rather variable.

Poeppig (1845) was not aware of Tulasne's publication (Tulasne, 1844). Both Poeppig and Tulasne recognized *Poeppig* 2666 as an undescribed species and both described it independently with the same collection as type (but with different holotypes).

Selected specimens examined. BRAZIL. **Amazonas:** Mun. Jutai, *Cid et al.* 8313 (INPA, MO). ECUADOR. **Pastaza:** Moretococha, *Gudiño* 1382 (MO). PERU. **Amazonas:** Rio Cenepa, *Ancuash* 1242 (MO, US). **Loreto:** Pucallpa, *Lao* 6 (F, NY, US). **San Martín:** Iamas, below English Evangelical Mission, *Belshaw* 3477 (GH, MO, NY, US). **Ucayali:** Km 37, Carretera Pucallpa–San Alejandro, *Simpson & Schunke* V. 36 (NY). VENEZUELA. **Amazonas:** Atures, Puerto Ayacucho, *Huber & Cerda* 1460 (NY, US, VEN). **Bolívar:** Reserva Forestal La Paragua, *Blanco* 647 (NY).

13. *Tachigali colombiana* Dwyer, Brittonia 14: 56. 1962. TYPE: Colombia. Valle: Bahía de Buenaventura, *Cuatrecasas* 19903 (holotype, F not seen; isotypes, MO!, US!).

Discussion. This is the only species of *Tachigali* occurring in the Pacific lowlands of Colombia west of the Andes. It is a tall tree, 25–30 m. Domatia are lacking and stipules were absent from all specimens seen. On the leaflets, secondary veins are impressed on the upper surface and prominently raised on the lower surface. The hypanthium is strongly oblique. Petals are ca. 5 × 2 mm and pubescent near the base. Stamens are dimorphic, with three stamens shorter and thicker than the others. The flowers are sessile or nearly so. *Tachigali colombiana* is known from Valle and Chocó departments at altitudes from 10–150 m.

Selected specimens examined. COLOMBIA. **Chocó:** Quibdó–Istmina Rd., 28–35 km S of Quibdó, *Gentry & Brand 36800* (INPA, MO). **Valle:** Bajo Calima, *Murphy et al. 532* (MO, US).

14. *Tachigali davidsei* Zarucchi & Herend., Fl. Venez. Guayana 4: 116. 1998. *Sclerolobium aureum* var. *grandiflorum* Dwyer, Lloydia 20: 81. 1957, non *Tachigali grandiflora* Huber, 1909. TYPE: Venezuela. Río Orinoco, *Chaffanjon 217* (holotype, P!).

Discussion. *Tachigali davidsei* can be readily identified by the golden-brown indument on twigs, inflorescences, and flowers; the lack of domatia; raised tertiary venation on the upper surface of the leaflets; the pectinate stipules (when present); and the symmetrical hypanthium. The base of the leaflets is symmetrical. Stamens are monomorphic; petals are ca. 5×2 mm.

Distribution. This species is fairly common in Venezuela along the Orinoco and its tributaries (Amazonas, Anzoátegui, Apure, Bolívar, Delta Amacuro, Guárico, and Monagas) and grows mostly along rivers or on the banks of lakes.

Selected specimens examined. VENEZUELA. **Amazonas:** Puerto Ayacucho, *Maguire et al. 36183B* (NY, US). **Anzoátegui:** Caño Mamo, *Colonello 1239* (MO). **Apure:** Río Arauca, *Davidse & Gonzalez 13387* (MO, US). **Bolívar:** 31 km W of Caicara, *Davidse 4362* (MO, NY, US). **Delta Amacuro:** Mpio. Casacoima, *Diaz et al. 6778* (MO). **Guárico:** Estación Biológica Calabozo, *Aristeguieta 5111* (COL, F, NY, VEN).

15. *Tachigali dwyeri* (R. S. Cowan) Zarucchi & Herend., Fl. Venez. Guayana 4: 116. 1998. Basionym: *Sclerolobium dwyeri* R. S. Cowan, Mem. New York Bot. Gard. 10: 83–85. 1961. TYPE: Venezuela. Amazonas: Río Guainia, Cano Pimichin, *Maguire et al. 41831* (holotype, US not seen; isotypes, GH!, MO!, NY!, P!).

Discussion. *Tachigali dwyeri* is best recognized by the combination of small flowers with petals (ca. 2×1.5 mm) about as large as sepals, sparse indument on inflorescences and flowers, terete domatia, and 4 to 5 pairs of leaflets. The base of the leaflets is somewhat asymmetrical but not strongly so. Stipules are pinnate with linear lobes but infrequently present. Stamens are monomorphic. The petals have a few hairs in the center near the base but are otherwise glabrous. *Tachigali dwyeri* is known from three collections in Amazonas, Venezuela: one from the Río Guainía, one from the Río Yatua, and one from the Río Casiquiare. The latter is sterile but has the characteristic stipules of *T. dwyeri*.

Additional specimens examined. VENEZUELA. **Amazonas:** Río Pacimoni, *Maguire et al. 41652* (GH, MO, NY, R); Solano, Bajo Casiquiare, *Williams 14734* (US).

16. *Tachigali eriopetala* (Ducke) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 399. 2007. Basionym: *Sclerolobium eriopetalum* Ducke, Arq. Inst. Biol. Veg. 2: 41. 1935. TYPE: Brazil. Amazonas: “prope Manaus silva non inundabili circa cataractas fluminis Taruma.” *Ducke s.n. (RB 24296)* (holotype, RB not seen; isotypes, K!, P!).

Discussion. This species is best recognized by its elliptic leaflets with dense, appressed to sericeous indument, absence of domatia, and, in flowering specimens, absence of stipules; small, entire, revolute bracts are sometimes present in the inflorescences. Petals are linear and densely pubescent. The base of the leaflets varies from obtuse to rounded and is only slightly asymmetrical. Specimens collected in the Reserva Florestal de Curua-Una in Pará are also included here. These specimens have larger, oblong leaflets with more pairs of secondary veins (6 to 8 in typical *Tachigali eriopetala*, ca. 10 in specimens from Curua-Una) and large, revolute stipules at the base of the leaves. Most of these specimens are sterile. The few fertile collections from this area have leaflets much like typical *T. eriopetala* and, with the exception of *Cavalcante 1510*, do not have stipules at the base of the leaves. *Tachigali eriopetala* has been reported from terra firme forest in Amazonas and Pará. It is similar to *T. hypoleuca* (Benth.) Zarucchi & Herend., which differs in having foliose stipules and being restricted to flooded forest. It can also be confused with *T. goeldiana* (Huber) L. F. Gomes da Silva & H. C. Lima, a species with glabrous petals, floral bracts longer than the buds, and leaflets with more (10 to 15) pairs of secondary veins, and that grows in flooded forest. Several specimens placed in *T. eriopetala* previously had been annotated by others as *Sclerolobium chrysophyllum*, a species with domatia and pectinate stipules.

Selected specimens examined. BRAZIL. **Amazonas:** Mun. Maues, *Zarucchi et al. 3117* (INPA, MG, MO). **Pará:** Santarem, *Cavalcante & Silva 1510* (IAN, MG, NY).

17. *Tachigali ferruginea* van der Werff, sp. nov. TYPE: Ecuador. Pastaza: 40 km S of Puyo, along rd. to Macas, near Pitirishka village, $01^{\circ}48'S$, $77^{\circ}47'W$, 26 Nov. 2000, *D. Neill 12932* (holotype, MO!; isotypes, K!, NY!). Figure 9.

A congeneris foliolis magnis basi rotundatis vel cordatis, nervis lateralibus numerosis et indumento ferrugineo recedit.

Tree, to 20 m, twigs ferruginous pubescent, the hairs partly erect, partly appressed ascending.



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Determined by Henk van der Werf 1997
Missouri Botanical Garden

ECUADOR

Tachigali ferruginea



MISSOURI BOTANICAL GARDEN HERBARIUM (MO)

Figure 9. *Tachigali ferruginea* (holotype).

Stipules pectinate, the lower lobes again pectinately divided, densely pubescent. Incomplete leaf with rachis ca. 40 cm, 5 pairs of leaflets, the rachis ferruginous pubescent, strongly sulcate on the lower half, and hollow, but domatia not abruptly swollen, the leaflets from 16×7 cm (basal ones) to 30×10 cm (distal ones), oblong or oblong-obovate, the base symmetrical, rounded to cordate, the tip abruptly acute, the upper surface sparsely appressed pubescent, the indument denser on the midrib and this also with scattered, erect hairs, lower surface densely greenish brown pubescent, the hairs appressed and completely covering the surface, the primary and secondary veins with some erect, ferruginous hairs; lateral veins 20 to 25 on each side. Incomplete inflorescences to 30 cm, ferruginous pubescent as on the twigs, paniculately branched, the ultimate, flower-bearing parts 4–6 cm; bracts not seen, caducous. Flowers densely grouped together, sessile, symmetrical, hypanthium and lobes densely pubescent, the lobes erect, ovate, ca. 3×2 mm, the cup 1.5–2 mm, symmetrical; petals linear, glabrous, 3–4 mm, stamens 10, equal, ca. 4 mm, with some stiff, ferruginous hairs near the base; ovary ca. 2 mm, densely ferruginous pubescent, style slender, ca. 2 mm, glabrous. Ovary attached in the center of the hypanthium. Fruit laterally compressed, ca. 16×4 cm, with 1 central seed.

Discussion. *Tachigali ferruginea* is only known from the flowering type collection, gathered in secondary forest along a road; a second, fruiting collection (Neill & Ceron 7598) possibly belongs here. The old flowers are reddish brown. The collector noted that the leaf petioles are inhabited by fierce, stinging ants. The new species can be readily recognized by its large leaflets with many pairs of secondary veins, its ferruginous indument, its pectinate stipules, and its symmetrically based leaflets. The fruiting collection consists of fallen fruits and leaflets and thus does not show the ferruginous indument on the twigs or leaf stalk, presence or absence of domatia, or stipules—characters required to confidently name the collection to species. It is largely placed here because of the number of secondary veins (20 to 25) and the symmetrical base of the leaflets. The indument on the old leaflets is dense, but partly worn off and paler than on the type specimen. According to the collectors, the fruiting tree appeared to be monocarpic and was dying. Several other species in Peru and adjacent Brazil also have large, densely pubescent leaflets, linear petals, and a symmetrical hypanthium, but these species differ in stipule type (entire and revolute), pilose petals, general

indument type, lower number of secondary veins per leaflet, or lack hollow, ant-inhabited leaf rachises. The type collection was initially identified as *Tachigali formicarum* Harms by the collector, and duplicates may have been distributed with this identification.

IUCN Red List category. *Tachigali ferruginea* is only known from two recent collections and is listed as Data Deficient (DD) (IUCN, 2001).

Paratype. ECUADOR. **Napo:** Reserva Biologica Jatun Sacha, $01^{\circ}04'S$, $77^{\circ}36'W$, 17–23 Jan. 1987, D. Neill & C. Ceron 7598 (MO).

18. *Tachigali formicarum* Harms. Verh. Bot. Vereins Prov. Brandenburg 48: 164, 1907. TYPE: Peru. Loreto: Tarapoto, *Ule* 6538 (holotype, B†; isotypes, K!, L!).

Tachigali tessmannii Harms, Notizbl. Bot. Gart. Berlin-Dahlem 9: 967, 1926. Syn. nov. TYPE: Peru. Loreto: Tessmann 4753 (holotype, B†, photo MO!).

Discussion. This species is easily recognized by the large, semiterete domatia, flowers with petals about the same size as sepals, petals with long yellow hairs, and the generally large leaflets. The yellow hairs on the petals are readily visible in opening flowers. The base of the leaflets is asymmetrical. Stamens are monomorphic. The hypanthium is symmetrical. Stipules are caducous and were absent from all specimens seen in this study. A fruiting, leafless collection (*Morawetz* 13-24988, K) seems to belong here, suggesting the species is monocarpic. Although many species of *Tachigali* have ant-inhabited domatia, the presence of aggressive ants is, in most species, only infrequently mentioned, but nearly all collections of *T. formicarum* mention the presence of stinging ants (“leaves full of tangarana ants which sting painfully,” *Woytkowski* 34445; “hormigas que pican fuerte,” *Schunke* V. 5255), thus the epithet of this species is well chosen. Harms distinguished *T. tessmannii* from *T. formicarum* by the more asymmetrical base of the leaflets of the latter. Collections cannot be separated based on this character alone, and therefore *T. tessmannii* is here placed in synonymy.

Selected specimens examined. PERU. **Amazonas:** Río Santiago, Comunidad Caterpiza, *Huashikat* 2306 (MO). **Huánuco:** Distr. Calleria, Km 90 San Alejandro, *Schunke* V. 5255 (F, US). **Loreto:** Río Marañón, just above Pongo de Manseriche, *Wurdack* 2287 (F, GH, US). **Pasco:** Palcazu, Río Icozacín, *Foster & d’Achille* 10213 (MO). **Ucayali:** Km 88, Pucallpa–Tongo Maria Rd., *Gentry et al.* 36368 (MO).

19. *Tachigali fusca* van der Werff, sp. nov. TYPE: Brazil. Acre: Mun. Tarauaca, Rio Tarauaca, seringal Universo, 20 Sep. 1994, D. Daly, M.

Silveira, R. Saraiva, L. A. Lima & N. Goldstein
8264 (holotype, NY!; isotype, MO!). Figure 10.

Inter species domatiis et petalis linearibus praeditas floribus glabris et indumento ramulorum inflorescentiarumque fusco diversa est.

Tree, to 22 m; twigs angular, densely fuscous tomentulose to tomentose, the surface covered by the indument. Leaves (often incomplete on herbarium specimens) to 70 cm, with 4 to 12 pairs of leaflets; petiole 4–6 mm diam., the domatia ca. 4 cm from the base, swollen, cylindrical, 8–10 mm diam., 2.5–8 cm, below the first pair of leaflets; leaflets 15–18 × 4–5 cm, oblong, the base unequal, with 1 lobe cordate, the other obtuse, the tip acute, the upper surface glabrous, lower surface densely appressed pubescent and with erect fuscous hairs along the major veins; secondary veins 12 to 15 pairs per leaflet; petiolules 4–5 mm, with a similar indument to that on the leaf rachis. Stipules not seen. Inflorescences profusely branched, densely fuscous pubescent, 15–25 cm, the ultimate flower-bearing branchlets 4–7 cm; bracts not seen. Flower buds turbinate, with a few hairs at the very base, otherwise glabrous; pedicels less than 1 mm, pilose. Hypanthium ca. 1 × 1.5 mm, glabrous. Sepals glabrous on both surfaces except for the ciliate margin, ca. 2 mm, concave; petals linear, slightly widened in the distal half, glabrous; stamens equal, ca. 3 mm, moderately brown pubescent on the proximal 1/3. Pistil ca. 2 mm, densely fuscous pubescent, the style slender, glabrous, about as long as the ovary. Hypanthium symmetrical or nearly so. Fruits (immature) ca. 7 × 1.5 cm.

Discussion. *Tachigali fusca* is easily recognized by the combination of glabrous flowers, large, densely pubescent leaflets, the size of the domatia, and the fuscous indument. The few other species of *Tachigali* with glabrous flowers all have much smaller leaflets that are glabrous or sparsely pubescent; none have a fuscous indument on the twigs and inflorescences. Only *T. ferruginea* shares large, oblong, densely pubescent leaflets, linear petals, a symmetrical hypanthium, and the presence of domatia in the leaf petioles with *T. fusca*, but the former has uniformly pubescent flowers, a symmetrical base of the leaflets, and a ferruginous indument, among other differences. *Tachigali fusca* is only known from three collections. The two paratypes are in fruit and have a less dense indument on the leaflets. Both have a fuscous indument, long domatia, and leaflets with an unequal base. One of the paratypes has some hairs on the hypanthium, while the hypanthium is glabrous in the other paratype.

IUCN Red List category. Because this species is only known from three recent collections, it is listed as Data Deficient (DD) (IUCN, 2001).

Paratypes. BRAZIL. **Acre:** Mun. de Mancio Lima, margen direita ao alto rio Moa, *Cid Ferreira et al.* 10032 (INPA, NY); Mun. de Cruzeiro do Sul, seringal Iracema, *Cid Ferreira et al.* 10781 (MEL).

20. *Tachigali glauca* Tul., Arch. Mus. Hist. Nat. 4: 165. 1844. TYPE: “Guiana Gallica” [French Guiana]. *LePrieur* 336 (holotype, P!; isotypes, L!, P!).

Sclerolobium myrmecophilum Ducke, Arch. Jard. Bot. Rio de Janeiro 1: 30. 1915. *Tachigali myrmecophila* (Ducke) Ducke, Arch. Jard. Bot. Rio de Janeiro 3: 91. 1922. Syn. nov. TYPE: Brazil, Pará: Belem, *Ducke s.n.* (MG 15659) (holotype, MG not seen; isotypes, BM!, R!, US!).

Discussion. Characteristic is the sparsely pubescent inner surface of the petals, with only some hairs in the basal, central part. Other species with a sericeous lower surface of the leaflets and domatia have a dense indument on at least the lower half of the petals (often on the lower 2/3). *Tachigali glauca* has slightly dimorphic stamens, foliose stipules (although these are infrequently present), terete domatia, and petals ca. 4 mm. The base of the leaflets is asymmetrical but not strongly so. This species is quite similar to *T. argyrophylla* and differs mainly in the sparse indument on the inner surface of the petals.

The name *Tachigali glauca* has not been used since Tulasne (1844); Dwyer (1954) did not mention it. No differences between this species and *T. myrmecophila* were found in this study, and therefore *T. myrmecophila* is placed in synonymy.

Distribution. *Tachigali glauca* has been reported from Pará, with two collections from Amapá, two from French Guiana, and one from Roraima.

Selected specimens examined. BRAZIL. **Amapá:** Serra do Navio, *Cowan* 38220 (IAN, US). **Pará:** Jacunda, Rio Tocantins, *Froes* 27090 (IAN, US). **Roraima:** Estrada Manaus Caracarai, Km 343, *Steward et al.* 106 (INPA, US). FRENCH GUIANA, *Leprieur* 336 (L, P). GUYANA, ca. 20 km S of Mabura Hill, *Polak* 321 (MO).

21. *Tachigali goeldiana* (Huber) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 399. 2007. Basionym: *Sclerolobium goeldianum* Huber, Bol. Mus. Paraense Hist. Nat. 6: 78. 1910. TYPE: Brazil, Pará: Rio Capim, *Huber s.n.* (MG 692) (holotype, MG!; isotype, BM!).

Discussion. *Tachigali goeldiana* is a small tree of riverbanks and flooded forests that is best recognized by its stiff leaflets with a symmetrical base and a dense, appressed, golden or silvery lower surface of the leaflets. Domatia are absent. Stipules are pectinate but rarely present. Petals are linear and glabrous. The inner surface of the sepals is glabrous. For their size, the leaflets have many lateral veins (10 to 15 on each side). *Tachigali goeldiana* has been confused with *T.*



Figure 10. *Tachigali fusca* (holotype).

hypoleuca, also a species of flooded forests with sericeous lower leaflet surface. However, *T. hypoleuca* differs in its foliaceous stipules, pilose petals, and fewer (up to six) pairs of lateral veins. *Tachigali goeldiana* is known from Pará, Amazonas, and Roraima in Brazil.

Selected specimens examined. BRAZIL. **Amazonas:** Ilha da Costa, Arirarra, *Poole 1719* (INPA, MG, MO, NY, US). **Pará:** Rio Capim, Ig. Caju, *Froes 24113* (IAN, NY, RB, US). **Roraima:** Rio Branco, at mouth of Rio Itapera, *Mori et al. 20111* (INPA, MO, NY).

22. *Tachigali grandistipulata* Harms, Notizbl. Königl. Bot. Gart. Berlin 6: 304. 1915. TYPE: Brazil. Roraima: Rio Branco, Surumu, Serra de Mairary, *Ule 8399* (holotype, B†; isotypes, F! [fragm.], K!, L!).

Discussion. This species resembles *Tachigala rigida* Ducke, but differs in its smaller flowers (petals ca. 5 mm vs. petals 8–9 mm in *T. rigida*) and monomorphic stamens (4–6 mm). The base of the leaflets is obtuse to rounded and more asymmetrical than in *T. rigida*. Domatia are present and semiterete. Stipules are foliose and large, to 5 × 3 cm in the specimen at K. The lower leaf surface is completely covered by the appressed indument. The stamens are about as long as the petals, while in *T. rigida* stamens are clearly longer than the petals. *Tachigali grandistipulata* is only known from the type collection from Roraima.

23. *Tachigali guianensis* (Benth.) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Basionym: *Sclerolobium guianense* Benth., Hooker's J. Bot. Kew Gard. Misc. 2: 237. 1850. TYPE: Guyana. *Rob. Schomburgk, 2nd coll. 598* (lectotype, designated by Zarucchi & Herendeen in Brako & Zarucchi, 1993: 1254. K not seen; duplicates, BM!, P!).

Sclerolobium radlkoferi Rusby, Mem. Torrey Bot. Club 6: 26. 1896. *Sclerolobium guianense* var. *radlkoferi* (Rusby) Dwyer, Lloydia 20: 98. 1957. Syn. nov. TYPE: Bolivia. Betw. Tipuani & Guanai, *Bang 1690* (holotype, NY not seen; isotypes, GH!, K!).

Sclerolobium uleanum Harms, Verh. Bot. Vereins Brandenburg 48: 168. 1907. *Sclerolobium tinctorium* var. *uleanum* (Harms) Dwyer, Lloydia 20: 95. 1957. *Tachigali uleana* (Harms) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Syn. nov. TYPE: Peru. Tarapoto, *Ule 6450* (holotype, B†; isotype, K!).

Sclerolobium subbullatum Ducke, Arq. Inst. Biol. Veg. 2: 42. 1935. *Tachigali subbullata* (Ducke) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 400. 2007. Syn. nov. TYPE: Brazil. Amazonas: “ca. Esperança ad ostium fluminis Javary,” *Ducke s.n. (RB 21298)* (holotype, RB not seen; isotypes, K!, P!, US!).

Discussion. *Tachigali guianensis* is readily recognized by the pilose indument on twigs, leaves,

and inflorescences; this is especially noticeable on young growth. The base of the leaflets is asymmetrical, stipules are pectinate, and the great majority of the specimens turn black upon drying. Petals are linear and glabrous, and domatia are lacking. Collections from Peru and Bolivia have a denser indument and have been described as *Sclerolobium radlkoferi* (from Bolivia) and *S. uleanum* Harms (from Peru). In this study, these specimens with a denser indument are included in *T. guianensis*. Ducke said *S. subbullatum* differed from *T. guianensis* in its larger and more or less bullate-rugose leaflets. However, specimens with larger and wider leaflets occur throughout the range of *T. guianensis*, and while some collections from Ecuador and Peru (*Neill 14618*, *Grandez 1395*) have bullate leaflets, others have flat leaflets. The concept of *T. guianensis* here presented is thus fairly broad, and more detailed studies may lead to the reestablishment of some synonyms as distinct species.

Distribution. *Tachigali guianensis* has a wide distribution and has been collected in Brazil (Amapá, Amazonas, Pará, and Roraima), Guyana, French Guiana, Suriname, Venezuela (Amazonas, Bolívar, and Delta Amacuro), Colombia (Putumayo), Peru (Cusco, Loreto, Madre de Dios), and Bolivia.

Selected specimens examined. BOLIVIA. **Beni:** Vaca Diez, *Boom 4368* (MG, MO, NY). **La Paz:** Copacabana (10 km S of Mapiri), *Krukoff 11020* (NY). **Pando:** 35 km N of Puerto America, *Jardim 2442* (MO, NY). **Santa Cruz:** PN Noel Kempff, *Quevedo 2697* (MO, NY). BRAZIL. **Amapá:** Camaipi, on rd. to Rio Preto, *Mori et al. 16545* (MG, NY). **Amazonas:** Mun. Humayta, near Livramento, *Krukoff 6903* (MO, NY, US). **Pará:** Rio Jipuru, Ilha do Marajo, *Rabelo & Rosa 3605* (MO, NY). **Roraima:** Ilha de Maraca, *Ratter et al. 63181* (NY). COLOMBIA. **Putumayo:** entre Umbria y Puerto Asis, *Cuatrecasas 10543* (COL, F, NY, US). ECUADOR. **Morona-Santiago:** Centro Shuar Yunkumas, *Neill & ASF Dendrology Course 14618* (MO). **Pastaza:** Puerto Sarayacu, *Lugo 3918* (MO). FRENCH GUIANA. Crique Ouaiqui, *Lemoine 7820* (NY). GUYANA. Mt. Roraima, *Tate 243* (NY). PERU. **Cusco:** Distr. Camanti, Maniti, *Timana 1159* (MO). **Loreto:** Orilla San Miguel, Río Yarapa, *Grandez 1395* (INPA). **Madre de Dios:** Tambopata, Explorer's Inn, *Gentry et al. 51539* (MO). SURINAME. Blakawatra creek, 10 km E of Jodensavanne, *Schulz 8238* (NY). VENEZUELA. **Amazonas:** Puerto Ayacucho, Río Cataniapo, *Castillo 2191* (MO, NY). **Bolívar:** 7 km NE of Ciudad Piar, *Liesner & Gonzalez 11485* (MO, US). **Delta Amacuro:** Depto. Tucupita, 5–14 km ESE of Los Castillos de Guayana, *Davidse & Gonzalez 16266* (MO, NY, US).

24. *Tachigali hypoleuca* (Benth.) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Basionym: *Sclerolobium hypoleucum* Benth., Hooker's J. Bot. Kew Gard. Misc. 2: 236. 1850. TYPE: Brazil. Amazonas: woody hills at Barra do Rio Negro, *Riedel s.n.* (holotype, K!).

Discussion. This species is best recognized by the sericeous indument of the leaflets, its plane, foliaceous stipules, the nearly symmetrical base of the leaflets, and the linear, pilose petals. Domatia are absent. Nearly all collections are from flooded forest. It is similar to *Tachigali eriopetala*, which is a tree from terra firme forest with caducous stipules and which has small, revolute bracts in the inflorescences. Differences with *T. goeldiana* are discussed under that species. *Tachigali hypoleuca* is a rather common species from Amazonas and Roraima in Brazil. A collection from Venezuela (*Stergios* 9703, from Apure) is tentatively placed here; in leaf characters and stipules it agrees with *T. hypoleuca*, but it has small swollen domatia at the base of the leaf rachis; flowers are too old to assist in identification.

Selected specimens examined. BRAZIL. **Amazonas:** Manaus, Igarape da Cachoeira Grande, *Ducke* 523 (F, GH, NY, R). **Roraima:** Rio Xeriuini, *Pires et al.* 13961 (IAN, US).

25. *Tachigali inconspicua* van der Werff, sp. nov.

TYPE: Ecuador. Napo: Estación Biológica Jatun Sacha, 450 m, 24–31 Dec. 1986 (fl.), *D. Neill & M. Asanza* 7565 (holotype, MO!; isotype, K!). Figure 11.

Tachigali amplifoliae similis, sed ab ea foliolis oblongis vel elliptico-oblongis basi plus minusve symmetricis et nervis lateralibus 8 ad 11 (nec 5 ad 7) recedit.

Large trees, 30–40 m; twigs angular, glabrous. Stipules persistent, 1- to 3-foliose, 1–2 × 1–2 cm, the 2 basal lobes when present smaller. Leaf rachis 20–30 cm, sparsely appressed pubescent, somewhat canaliculate, especially just below the attachment of the leaflets; domatia lacking; leaflets 5 to 8 pairs, petiolules 5–8 mm, sparsely appressed pubescent, oblong to elliptic-oblong, 8–15 × 2.5–5 cm, chartaceous, the base ± symmetrical, apices acute or acuminate, acumen ca. 1 cm, secondary veins 8 to 11 pairs per leaflet. Inflorescences paniculate, moderately to densely appressed pubescent, 15–20 cm, the ultimate, flower-bearing racemes to 10 cm; bracts caducous, not seen; pedicels 0.6–1 mm, buds uniformly grey appressed pubescent. Hypanthium turbinate, symmetrical, ca. 1 × 1.5 mm, sepals ca. 2 mm, elliptic, concave, the inner surface appressed pubescent; petals ca. 2 mm, linear, densely yellow pubescent; stamens equal, 4–5 mm, the filaments yellow pubescent on the basal quarter; ovary 1.5–2 mm, covered with stiff, brown hairs. Legume samaroid, ellipsoid, ca. 8 × 2.5 cm, 1-seeded.

Discussion. As the name suggests, *Tachigali inconspicua* does not have striking features. It belongs in the group of species with linear, pilose

petals, and a symmetrical hypanthium that lacks domatia. In this group it stands apart by the combination of rather large, foliose stipules, yellow hairs on the petals, and a more or less symmetrical base to the leaflets. It is closest to *T. amplifolia*, which differs in its larger, broader leaflets (to 20 × 11 cm) with fewer secondary veins (5 to 7 vs. 8 to 11) and a more asymmetrical base. *Tachigali inconspicua* is known from the Andean foothills from central Ecuador (Jatun Sacha) to the Río Cenepa Basin in northern Peru. All collections known to date are from tall trees, most estimated as 30 m and one as 40 m tall. Eighteen duplicates were made of the type collection, all but the holotype were distributed as *T. paraensis*.

IUCN Red List category. Given its distribution in Amazonian Ecuador and Peru, this species is listed as Least Concern (LC) (IUCN, 2001).

Paratypes. ECUADOR. **Napo:** Orellana Canton, 5 km N de Coca, *W. Palacios* 3179 (MO, NY); Huaorani Ethnic Reserve, vic. of the Dicaro community, *N. Pitman et al.* 4305 (MO). **Morona-Santiago:** carretera Bomboiza–Gualaquiza, a 8 km de la Mision, fl., *J. Zaruma* 359 (MO). **Zamora-Chinchipe:** Río Nangaritza, downriver from Miazhi to Pachicutza, fl., *D. Neill & W. Palacios* 9708 (MO); same locality, fr., *D. Neill & W. Palacios* 9707 (MO). PERU. **Amazonas:** S of Huampami trail, S of Río Cenepa, fl., *B. Berlin* 1660 (MO, US); Condorcanqui prov., El Cenepa, Comunidad de Mamayaque, fr., *R. Roja, A. Peña & E. Chávez* 345 (MO). **Loreto:** Fundo Acosta, Río Maniti, *F. Encarnacion E-1010* (MO, NY, US); Iquitos, Alto do Itaja, *A. Ducke* 1814 (F, IAN, MG, US).

26. *Tachigali leiocalyx* (Ducke) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 399, 2007. Basionym: *Sclerolobium leiocalyx* Ducke, Bol. Tecn. Inst. Agron. N. 2: 19, 1944. TYPE: Brazil. Amazonas: São Paulo de Olivença, *Ducke* 1028 (lectotype, designated here, RB not seen; duplicates, GH!, K!, MO!, R!).

Discussion. This species is easily recognized by the glabrous sepals, linear, pubescent petals, and the coriaceous, elliptic to elliptic-ovate leaflets. The base of the leaflets is obtuse to rounded, weakly asymmetrical. Domatia are lacking, and stipules have not been seen on the few known specimens. According to the labels, the three known collections were all made in caatinga forest near São Paulo de Olivença. Silva and Lima (2007) indicated that the holotype is in RB; unfortunately, a lectotype has to be selected because Ducke (1944) cited two collections as syntypes. Two species were distributed under *Ducke* 1028. One consists of the lectotype and isoelectotypes of *Tachigali leiocalyx* (in GH, K, MO, R, and RB), while the other (in MO and US) represents *T. inconspicua*.



Figure 11. *Tachigali inconspicua* (holotype).

Additional specimens examined. BRAZIL. Amazonas: São Paulo de Olivença, *Ducke 1498* (NY, R); *Lima et al. 2771* (MO).

27. *Tachigali longiflora* Ducke, Arq. Inst. Biol. Veg. 2: 38. 1935. TYPE: Brazil. Amazonas: "São Paulo de Olivença, silva non inundabili," *Ducke s.n. (RB 24291)* (holotype, RB not seen; isotypes, K!, P!, US!).

Discussion. *Tachigali longiflora* is a striking species because of its very dark brown inflorescences and flower buds. The flowers are rather large for the genus (to 1.8 cm), and the hypanthium is unusually long and curved; this is best visible just after anthesis and after the petals have fallen. Stamens are dimorphic. Petals are large, ca. 8×4 mm. Stipules have not been seen for this study; Ducke mentioned he had seen one incomplete stipule, this pinnate, with narrow segments. Domatia have also not been seen in this study, though Ducke mentioned the presence of small ants in the leaf rachis. The leaflets have an asymmetrical base and vary from ovate-elliptic (basal pairs) to oblong (distal pairs).

Additional specimens examined. PERU. Loreto: Jenaro Herrera, *Huamantupa et al. 5358* (MO), *Daly et al. 5741* (MEL, MO), *Spichiger 1490* (MO).

28. *Tachigali loretensis* van der Werff, sp. nov. TYPE: Peru. Loreto: Prov. Maynas, Alpahuayo, 12 Nov. 1984 (fl.), *R. Vasquez, J. Ruiz & N. Jaramillo 5888* (holotype, MO!; isotypes, F!, K!, NY!). Figure 12.

Tachigali ptychophyscae Benth. similis, sed ab ea floribus minoribus et staminibus uniformibus recedit.

Tall trees, to 40 m; twigs terete, minutely and densely appressed pubescent. Stipules not seen; leaf rachis 10–20 cm, minutely and moderately densely appressed pubescent, terete; domatia present, terete, 1.5–3 cm, 4–6 mm diam., less than 1 cm from the base of the leaves; leaflets 4 to 6 pairs, $5\text{--}13 \times 3\text{--}6$ cm, ovate to elliptic, chartaceous, the upper surface glabrous, lower surface inconspicuously and moderately to sparsely appressed pubescent, the base asymmetric, the apex acute to acuminate, acumen to 1 cm, secondary veins 3 to 8 pairs per leaflet. Inflorescences paniculate, 15–25 cm, densely and minutely appressed pubescent, the ultimate racemes to 10 cm, bracteoles ca. 5 mm, narrowly ovate to linear, falling off as buds mature and absent from the base of the mature flowers; pedicels to 1 mm, buds uniformly and densely grey pubescent. Hypanthium asymmetrical; sepals broadly ovate, $2\text{--}3 \times$ ca. 1.5 mm, pubescent on the inner surface; petals slightly longer than the sepals, to 2 mm wide, ovate, pubescent on the inner surface,

glabrous on the outer surface, stamens 10, monomorphic, ca. 5 mm, pubescent near the base; ovary ca. 1.5 mm, densely pubescent, style ca. 2.5 mm, pubescent near the base, becoming glabrous distally. Fruits unknown.

Discussion. Vegetatively, *Tachigali loretensis* closely resembles *T. ptychophysca*. Both species have leaflets with few lateral veins, terete domatia close to the base of the petiole, and a similar leaflet shape. The specimens from Colombia of *T. loretensis* have more lateral veins, up to eight pairs per leaflet. However, *T. ptychophysca* differs in its larger flowers with sepals 4–5 mm, petals 5–6 mm, and stamens 10–12 mm, and in its dimorphic stamens. The appressed indument on the lower surface of the leaflets is also denser in *T. ptychophysca* and appears almost sericeous. *Tachigali loretensis* is known from three flowering collections made in non-flooded forest on white sand near Iquitos and two flowering collections from Vaupes, Colombia. Seedlings and juvenile trees have distinctly acuminate leaflets, with an acumen up to 4 cm.

IUCN Red List category. *Tachigali loretensis* does not have a wide distribution (northeast Peru and adjacent Colombia). However, sterile collections from forest plots suggest that it is locally common and it is therefore listed as Vulnerable (VU) (IUCN, 2001).

Paratypes. COLOMBIA. Vaupes: Río Kananari, Cerro Isibukuri, *Schultes & Cabrera 14691* (COL, GH); Río Kananari y Cerro Isibukuri, Nov., *H. Garcia-Barriga 13771* (COL, US). PERU. Loreto: Prov. Maynas, Mishana, Río Nanay, fl., *Gentry et al. 39315* (MO); Prov. Maynas, Alpahuayo, *Vasquez & Criollo 5761* (MO).

29. *Tachigali macbridei* Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Replaced synonym: *Sclerolobium rigidum* J. F. Macbr., Field Mus. Nat. Hist., Bot. Ser. 13: 201. 1943, non *Tachigali rigida* Ducke, 1938. TYPE: Peru. Loreto: Pumayacu, *Klug 3239* (holotype, F not seen; isotypes, GH!, MO!).

Discussion. This species can be easily confused with *Tachigali chrysophyllum*; it is best separated from this species by the erect indument on the leaf rachis. In this character, it approaches *T. guianense*, but the latter lacks the sericeous indument on the lower surface of the leaflets. Stipules are pectinate. Domatia are often present in large leaves, but lacking in small leaves. The base of the leaflets is asymmetrical. Petals are linear and glabrous. Most collections are from upland forest. *Tachigali macbridei* is known from six departments in Peru, with a few collections from adjacent Brazil (Acre).

Several collections from Peru (Amazonas) have nearly sessile leaflets with a cordate base clasping the rachis.

Selected specimens examined. BRAZIL. **Acre:** near mouth of Rio Macauhan, *Krukoff* 5469 (GH, MO, NY). PERU. **Amazonas:** Distr. Imaza, Comunidad Agauruna de Kusu-Listra, *Diaz et al.* 8220 (MO). **Cusco:** Distr. Echarate, Kiteni, *Huamantupa et al.* 7225 (MO). **Huanuco:** Tingo Maria, *Asplund* 13171 (NY). **Loreto:** Río Nanay, carretera de Picuruyacu, *Rimachi* 4034 (MO, NY). **Madre de Dios:** Parque Nacional Manu, *Foster et al.* 11850 (MO, NY). **San Martín:** Caseria Nueva Union abajo de Puerto Huicte, *Schunke* 1. 7936 (MO, US).

30. *Tachigali macropetala* (Ducke) L. F. Gomes da Silva & H. C. Lima, *Rodriguésia* 58: 399. 2007. Basionym: *Sclerolobium macropetalum* Ducke, *Arq. Inst. Biol. Veg.* 2: 41. 1935. TYPE: Brazil. Amazonas: “Rio Negro superioris inter Camanaos et ostium fluminis Curicuriary,” *Ducke s.n. (RB 23328)* (holotype, RB not seen; isotypes, K!, P!).

Discussion. *Tachigali macropetala* is a very distinct species and is easily recognized by the essentially glabrous sepals (but with a fringe of hairs along the margin), the symmetrical hypanthium, rather long pedicels (3–6 mm), elliptic petals clearly longer than the sepals, and leaflets with a symmetrical base and immersed venation on the upper surface. Domatia are lacking. Stipules are 2-foliose, 1–2 cm, but rarely present. Stamens are monomorphic. All but one of the collections are from riverbanks or flooded forest along the upper Rio Negro.

Selected specimen examined. BRAZIL. **Amazonas:** Rio Curicuriary, *Ducke* 42 (F, NY).

31. *Tachigali macrostachya* Huber, *Bol. Mus. Paraense Hist. Nat.* 5: 387. 1909. TYPE: Brazil. Pará: “in ripis insulae Veneza fl. Mapuera,” *Ducke s.n. (MG 9030)* (holotype, MG not seen; isotype, BM!).

Discussion. This is a very distinct species because of its large, oblong-ovate, bullate leaflets with a cordate, symmetrical base, and large flowers with 15 or more stamens. The petals are 7–8 mm long and pubescent on the inner surface. Stamens are dimorphic. The leaf petioles are not noticeably swollen, but are hollow and inhabited by ants. Leaf rachises are strongly angular. Stipules are to 3 cm long and foliose with 1 to 2 pairs of lobes, but caducous. The hypanthium is strongly asymmetrical. *Tachigali macrostachya* is a small tree growing on riverbanks. Dwyer (1954) listed the Río Mapuera in Venezuela as the type locality, possibly misled by the actual type locality given by Huber (“in ripis insulae Veneza”). The seven collections seen in this study are all from the Rio

Trombetas–Rio Mapuera area in Pará, Brazil. Ducke (1949) also reported it from the Rio Jamunda (border of Pará and Amazonas).

Selected specimen examined. BRAZIL. **Pará:** Mun. Oriximina, Rio Trombetas, *Cid et al.* 1256 (INPA, MG, MO, US).

32. *Tachigali melanocarpa* (Ducke) van der Werff, comb. nov. Basionym: *Sclerolobium melanocarpum* Ducke, *Arq. Inst. Biol. Veg.* 2: 43. 1935. TYPE: Brazil. Amazonas: “prope Borba, Rio Madeira infer.,” *Ducke s.n. (RB 23330)* (lectotype, designated here, RB not seen; duplicates, K!, P!).

Discussion. *Tachigali melanocarpa* is very similar to *T. paraensis* in leaflet shape (both have a cuneate, more or less symmetrical base), and the two are easily confused. The clearest difference seems to be found in the densely hairy, linear petals: with yellow hairs in *T. melanocarpa* and white hairs in *T. paraensis*. On average, the leaflets are larger in *T. paraensis*. Also, in *T. melanocarpa* stipules fall early from young branchlets, whereas in *T. paraensis* stipules are frequently persistent, unifoliate, and foliose, to 2.5 cm. In both species, small, revolute bracts are occasionally present along the inflorescences. Domatia are absent. The hypanthium is symmetrical. Ducke (1935) also stated that the rachis and leaf petiole are canaliculate in *T. melanocarpa*, although this was not apparent on material seen in this study. The leaf rachis is somewhat flattened in *T. melanocarpa* and terete in *T. paraensis*, but this single character difference hardly warrants recognition of two separate species. *Tachigali melanocarpa* has been reported from Amazonas and Pará, Brazil, and occurs in terra firme forests. The protologue cites *Ducke RB 23339* as one of the syntypes, but the K and P sheets carry the number *Ducke RB 23330*. Ducke cited two collections in his description of *Sclerolobium melanocarpum*, one with flowers and one with fruits. The RB specimen of the flowering collection is designated here as the lectotype.

Selected specimens examined. BRAZIL. **Amazonas:** Reserva 1501, Projecto Fragmentos Florestais, 90 km NNE de Manaus, *Oliveira et al.* 361 (INPA, MO, NY). **Pará:** Jari, Estrada entre Monte Dourado e Mungaba, *Silva* 1978 (NY, US).

33. *Tachigali melinonii* (Harms) Zarucchi & Herend., *Monogr. Syst. Bot. Missouri Bot. Gard.* 45: 1254. 1993. Basionym: *Sclerolobium melinonii* Harms, *Bot. Jahrb. Syst.* 33 (Beibl. 72): 24. 1903. TYPE: French Guiana. Maroni [Saint-Laurent-du-Maroni]; *Melinon s.n. in 1861* (holotype, B†; isotype, P!).

Discussion. *Tachigali melinonii* is an inconspicuous species, but is easily recognized by its sparse, stellate indument. No other species of *Tachigali* has stellate hairs. Stipules of this species have not been seen. Domatia are lacking. Petals are slightly longer than the sepals, glabrous, linear or slightly dilated, but fall off readily and are thus often lacking on herbarium specimens. The base of the leaflets is asymmetrical. Habitat data, when given by collectors, indicate this is a species of terra firme forest. It has been reported from Suriname, French Guiana, Brazil (Amapá, Amazonas), and Peru (Loreto), but is uncommon in herbaria.

Selected specimens examined. BRAZIL. **Amapá:** Mun. Mazagão, *Silva* 5525 (INPA). **Amazonas:** Reserva 1501, Projeto Fragmentos Florestais, *Mori et al.* 20617 (INPA, MO). FRENCH GUIANA. Crique Passoura, Région de Kourou, *Sabatier & Prévost* 3753 (NY). PERU. **Loreto:** Jenaro Herrera, *Gentry et al.* 56376 (MO).

34. *Tachigali micrantha* (L. O. Williams) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Basionym: *Sclerolobium micranthum* L. O. Williams, Fieldiana, Bot. 31: 32. 1965. TYPE: Peru. Huánuco: *Gutierrez* 44 (holotype, F not seen; isotypes, K!, US!, WIS not seen).

Discussion. This species is easily recognized by the combination of glabrous sepals, small, obovate petals shorter than the sepals, and the rather dense, erect indument on the lower surface of the leaflets. Domatia are lacking; stipules are laciniate, to 2 cm, and the base of the leaflets is obtuse to subcordate and somewhat asymmetrical. The flowers are small and clearly pedicellate, with the pedicels about as long as the flowers. For this study, only the K and US isotypes and the fruiting paratype (*Gutierrez* 96) have been seen.

35. *Tachigali micropetala* (Ducke) Zarucchi & Pipoly, Sida 16: 787. 1995. Basionym: *Sclerolobium micropetalum* Ducke, Bol. Tecn. Inst. Agron. N. 2: 20. 1944. TYPE: Brazil. Amazonas: Manaus, "silva terris altis argillosis ultra Flores," *Ducke* 1219 (holotype, IAN not seen; isotypes, MO!, US!).

Discussion. This species is easily recognized by the combination of small flowers and the distally glabrous sepals. Petals are elliptic, to 1 mm. Stamens are monomorphic. Stipules have not been seen on any of the flowering specimens studied, but are present on two sterile specimens (*Ducke s.n.* [RB 20343], *Evans & Peckham* 2941); they are densely pubescent and pectinate. Domatia are lacking. Leaflets near the base of the leaf have an asymmetrical base, whereas the distal leaflets have a more symmetrical base. The

margins of the leaflets are frequently inrolled. *Tachigali micropetala* is known from the area near Manaus, from Pará in Brazil, Guyana, French Guiana, Suriname, and Venezuela.

Selected specimens examined. BRAZIL. **Amazonas:** Estrada Manaus–Itacoatiara, Km 13.1, *Rodrigues & Loureiro* 9510 (INPA). **Pará:** Jari, Estrada entre Tinguelim e S. Miguel, *Silva* 3322 (IAN). FRENCH GUIANA. **Saül:** circuit Limonade, *Moretti* 743 (US). GUYANA. Moraballi Creek, *Fanshawe* 571 (NY). SURINAME. Mapanagebied, *Schulz* 7703 (GH, NY). VENEZUELA. **Delta Amacuro:** esterores de El Palmar, *Marciano Berti* 635 (MO).

36. *Tachigali odoratissima* (Benth.) Zarucchi & Herend., Fl. Venez. Guayana 4: 116. 1998. Basionym: *Sclerolobium odoratissimum* Benth. in Mart., Fl. Bras. 15(2): 48. 1870. TYPE: Brazil. Amazonas: *Spruce* 3057 (holotype, K!; isotype, P!).

Discussion. *Tachigali odoratissima* is best recognized by the narrow leaflets with a symmetrical base and glabrous or sparsely appressed pubescence on the lower surface. Stipules are 1- to 3-foliose and ca. 1 cm. Petals are linear and densely pubescent. Stamens are equal. Domatia are terete and generally 2–4 cm. Nearly all collections seen in this study are from flooded forests or were made along rivers. It is a common species in Brazil (Amazonas, along the Rio Negro and tributaries; one collection is known from the Rio Japura) and Venezuela (Amazonas, along the Río Negro and the Río Orinoco and their tributaries). There are a few records from Colombia (Guainía and Vichada).

Selected specimens examined. BRAZIL. **Amazonas:** Barcelos, *Duarte* 7252 (F, HB, INPA, US). COLOMBIA. **Guainía:** Caño Mina, en el Río Inirida, *Espina* 338 (COL). **Vichada:** Puerto Nuevo, *Daniel* 127 (COL). VENEZUELA. **Amazonas:** lower part of the Río Baria, *Davidse* 27598 (MO, NY).

37. *Tachigali paniculata* Aubl., Hist. Pl. Guiane 1: 372. 1775. TYPE: French Guiana. *Aublet s.n.* (holotype, BM!).

Tachigali trigona Aubl., Hist. Pl. Guiane 1: 374. 1775. TYPE: French Guiana. *Aublet s.n.* (holotype, BM!).

Tachigali sericea Tul., Arch. Mus. Hist. Nat. 4: 163. 1844. TYPE: Brazil. Pará: *Poeppig* 3039 (lectotype, designated here, P!; duplicate, L!).

Tachigali eriocalyx Tul., Arch. Mus. Hist. Nat. 4: 164. 1844. TYPE: Brazil. Amazonas: Ega, *Poeppig* 2737 (holotype, P!; isotype, L!).

Tachigali angustifolia Miq., Stirp. Surinam. Select. 13. 1851. *Tachigali paniculata* var. *angustifolia* (Miq.) Dwyer, Ann. Missouri Bot. Gard. 41: 239. 1954. TYPE: Suriname. *Kappler* 1931 (holotype, U not seen).

Tachigali grandiflora Huber, Bol. Mus. Paraense Hist. Nat. 5: 388. 1909. Syn. nov. TYPE: Brazil. Pará: "in silvis ripariis ad fl. Mapuera," *Ducke s.n.* (MG 8965) (holotype, MG not seen; isotype, BM!).

Tachigali ulei Harms, Notizbl. Königl. Bot. Gart. Berlin 6: 306. 1915. Syn. nov. TYPE: Brazil. Amazonas: Rio Negro, São Joaquim, *Ule* 6042 (holotype, B†; isotypes, K!, L!, MG!).

Tachigali rusbyi Harms, Bot. Jahrb. Syst. 33, Beibl. 72: 20. 1903. Syn. nov. TYPE: Venezuela. Orinoco: *Rusby* 127 (holotype, B†; isotypes, GH!, MO!).

Tachigali pulchra Dwyer, Ann. Missouri Bot. Gard. 41: 249. 1954. Syn. nov. TYPE: Venezuela. Bolívar: Alto Río Paragua, *Cardona* 1180 (holotype, US!).

Tachigali paniculata var. *comosa* Dwyer, Ann. Missouri Bot. Gard. 41: 240. 1954. Syn. nov. TYPE: Brazil. Amazonas: São Paulo de Olivença, *Krukoff* 8851 (holotype, MO!; isotype, GH!).

Discussion. Here, *Tachigali paniculata* is accepted as a wide-ranging and variable species, known from the Guianas to Peru. It is also the most frequently collected species of *Tachigali*. Domatia are mostly absent, but sometimes present and semiterete. Of 16 collections checked from the Iquitos area, all from flooded forest, two had well-developed domatia, two had some duplicates with domatia and others without, two had the petiole bases not thickened (but ant holes were present in the petiole), and the rest had no traces of domatia or ant habitation. Therefore, presence or absence of domatia is not considered to be a diagnostic character of *T. paniculata*. Stamens are dimorphic, with three stamens shorter and falcately curved, and this character separates *T. paniculata* from *T. alba*, which has monomorphic stamens. *Tachigali alba* and *T. richardiana*, another similar species, also differ in their terete leaf rachises; these are sharply angular in *T. paniculata*. Stipules, when present, are foliose, with one or two pairs of lobes. The base of the leaflets is asymmetrical. Leaflets are often glabrous or nearly so, but sometimes may be moderately to densely appressed pubescent on the lower surface. Nearly all collections come from flooded forest, and most trees are less than 15 m tall (occasionally reaching 20 m).

However, there is so much morphological variation in *Tachigali paniculata* (as recognized in this study) that additional analysis may reveal further data sufficient to segregate more taxa from among the current synonymy.

Of the two syntypes of *Tachigali sericea*, Poeppig 3039 has flowers and is selected as lectotype, while the specimen from the Richard herbarium (French Guiana. Herb. *Richard* s.n. [P]) has fruits. The latter has a denser indument on the leaflets.

Tachigali grandiflora differs from typical *T. paniculata* in several qualitative and quantitative characters. The leaflets are thinner, have an acuminate tip, and have the secondary and tertiary venation raised on the lower surface. The flowers are rather large, larger than average for *T. paniculata*. However, other collections placed in *T. paniculata* can have

some of these characters, although not all on the same specimen. To date, not a single specimen has been seen that matches the type of *T. grandiflora*; therefore, it has been included (with some hesitation) as a synonym of *T. paniculata*.

Ule 6042 was first identified by Harms (1907) as *Tachigali paniculata* and in 1917 was promoted, without comment, to the type of *T. ulei*. In this study, Harms's first identification is accepted, and thus *T. ulei* is considered a synonym of *T. paniculata*.

Tachigali rusbyi Harms was said to differ from *T. paniculata* in its smaller flowers. The flowers certainly do not differ in size by enough to warrant recognition of a separate species. Stamens of *T. rusbyi* are less clearly dimorphic than in most collections of *T. paniculata*, but they are not equal either. Dwyer (1954) emphasized the sharply angled petioles of *T. rusbyi*, but specimens with such petioles occur throughout the range of *T. paniculata*.

Tachigali pulchra was recognized solely based on its long-stipitate ovary. Dwyer's description ("stipes ovarii 3–8 mm longus... ovario 1–2 mm longo... fructus non visus") suggests that the ovaries are long-stipitate in the flowering stage. The holotype does not show such long-stipitate ovaries in the flowers, but does have some young fruits (to 3 cm) and these are indeed rather long-stipitate. According to Dwyer, in other characters *T. pulchra* was indistinguishable from *T. rusbyi* (the types of both species were collected in the Orinoco drainage in Venezuela), and it seems best to place *T. pulchra* as a synonym of *T. paniculata*.

Most collections of *Tachigali paniculata* are from medium-sized trees in flooded forest and range from the Guianas, throughout Amazonian Brazil, to Venezuela and Peru.

Selected specimens examined. BOLIVIA. **Pando:** Río Negro near jct. with Río Abuna, *Gentry & Perry* 77998 (MO). BRAZIL. **Acre:** Mun. Mancio Lima, Parque Nacional da Serra do Divisor, *Daly et al.* 9012 (MO). **Amapá:** Rio Araguari, *Pires et al.* 50387 (F, GH, IAN, MG). **Amazonas:** Tarumã Grande, *Keel & Guedes* 281 (US). **Pará:** Mun. Oriximina, Rio Trombetas, *Cid et al.* 1773 (MG, MO, US). **Rondônia:** Mun. Jaru, Km 428 estrada Cuiabá–Porto Velho, *Cid et al.* 5000 (MEL). COLOMBIA. **Amazonas:** Loretoyacu River, *Schultes* 8266 (COL). **Vaupés:** Mitu, lower Río Kubitu, *Zarucchi* 2151 (MO, US). FRENCH GUIANA. Rivière Grand Inini, *de Granville* B-3634 (HB). GUYANA. Cuyuni River, Akarabice Creek, *Tutin* 440 (US). PERU. **Loreto:** Maynas, Caserio Casococha, *Revilla* 1527 (MO, US). SURINAME. Lower slopes of Juliana Top, *Irwin et al.* 54827 (F, US). VENEZUELA. **Amazonas:** Alto Río Orinoco betw. Tama-Tama and Esmeralda, *Maguire et al.* 41550 (F, NY). **Bolívar:** Alto Río Paragua, *Cardona* 1182 (US). **Delta Amacuro:** Río Amacuro, upstream from San Victor, *Steyermark* 87233 (F, US).

38. *Tachigali paraensis* (Huber) Barneby, Brittonia
48: 182. 1996. Basionym: *Sclerolobium paraense*

Huber, Bol. Mus. Paraense Hist. Nat. 6: 79. 1910. TYPE: Brazil, Pará: "in silvis paraensibus ad viam ferream inter capitalem et Bragança," *Rodolpho Siquiera Rodrigues s.n. (MG 9642)* (holotype, MG not seen; isotypes, BM!, F!, K!, MO!, US!).

Sclerolobium albiflorum Benoist, Bull. Soc. Bot. France 66: 383. 1919. *Tachigali albiflora* (Benoist) Zarucchi & Herend., Fl. Venez. Guayana 4: 115. 1998. TYPE: French Guiana, *Benoist 1074* (holotype, P!).

Discussion. This species is best recognized by the leaflets with a cuneate, more or less symmetrical base, linear, densely white pubescent petals, and large stipules. Occasionally, small, strongly revolute bracts are present in the inflorescences. Domatia are absent. Stamens are monomorphic. This species is very similar to *Tachigali melanocarpa*, and differences between the two are discussed under that species. There has been some confusion about the type specimens. On the label of the MG holotype (photo at F), the collector is given as Rodolfo S. Rodrigues and the type locality is listed as "Estação agr. Peixe Boi." Isotypes distributed by RB (no. 5620), with the type information retyped, gives the type locality as Peixe Boi, and R. Siqueira as collector. These labels (on specimens in F, K, and US) also give the MG herbarium number (9642). MO has a sheet with an older, handwritten RB label annotated with the number 5620 and citing Rodolpho Siq. Rodrigues as collector. The type locality is still given as Peixe Boi. Dwyer, in his revision of *Sclerolobium* (1957), stated that he had not seen the type of *Sclerolobium paraense*, but cited among the specimens he had seen "Estação de Peixe Boi, Rodrigues 9642" (MO) and "Peixe Boi, R.R. between Belem do Para & Bragança, Siqueira Herb. no. 5620" (K, NY, US), all of which I consider isotypes.

Distribution. *Tachigali paraensis* is known from the states of Maranhão and Pará in Brazil, French Guiana, Suriname, and eastern Venezuela (Bolívar, Delta Amacuro).

Selected specimens examined. BRAZIL. **Maranhão:** Mun. Carutapera, *Balee & Ribeiro 2692* (MO). **Pará:** Km 93 Rodovia Belem-Brasília, *Kuhlmann & Jimbo 42* (IAN, MG, NY, SP). FRENCH GUIANA. **Saül:** La Fumée Mountain Trail, *Mori & Hartley 18460* (MO). SURINAME. Jodensavanne Mapanekreek area, *Elburg LBB 9462* (MO). VENEZUELA. **Bolívar:** al sur de El Dorado, en el drenaje del Río Cuyuni, *Stevermark & Dunsterville 104447* (MO, NY, US). **Delta Amacuro:** este-noreste de El Palmar, *Marciano Berti 216* (INPA, MBM, MO, NY).

39. *Tachigali peruviana* (Dwyer) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. *Sclerolobium paniculatum* var. *peruvianum* Dwyer, Lloydia 20: 94. 1957. TYPE:

Peru, San Martín: Alto Río Huallaga, *Williams 5701* (holotype, F not seen).

Discussion. *Tachigali peruviana* can be recognized by the combination of the sericeous lower surface of the leaflets, the linear, glabrous petals, pedicellate flowers, asymmetrical base of the leaflets, and lack of domatia. Stipules are caducous, and none were seen in this study. It differs from *T. vulgaris* L. F. Gomes da Silva & H. C. Lima in the dense, sericeous indument of the lower surface of the leaflets. *Tachigali subvelutina* (Benth.) Oliveira-Filho is very similar; it has a denser, semi-erect indument on the leaflets and twigs. This is best seen on the inflorescence axes and rachis of leaves, which are strictly appressed pubescent in *T. peruviana*. Two collections from Humaitá, Amazonas (*Teixeira et al. 199 & 912*), are provisionally placed here; they have larger and wider leaflets, and the flower-bearing branches of the inflorescences are much longer and flexuous. The type of *T. peruviana* has not been seen in this study. *Tachigali subvelutina* has a distinct geographical distribution, a different indument, and occurs in cerrado vegetation and, therefore, should not be confused with *T. peruviana*. However, the differences between the two species are otherwise weak.

Selected specimens examined. BOLIVIA. **Beni:** Km 29 of rd. from Riberalta to Guayaramirim, *Maas et al. 8675* (MO). **Santa Cruz:** Parque Nacional Noel Kempff, *Guillen & Killeen 2710* (MO, NY). BRAZIL. **Amazonas:** Mun. Humaitá, *Teixeira et al. 912* (INPA, MEL, MG, MO). **Rondônia:** Km 5 da rodovia Vilhena-Porto Velho, *Silva & Pinheiro 4112* (INPA, MG, NY). PERU. **Junín:** Chunchuyacu, *Woytkowski 5578* (MO, NY).

40. *Tachigali physophora* (Huber) Zarucchi & Herend., Fl. Venez. Guayana 4: 116. 1998. Basionym: *Sclerolobium physophorum* Huber, Bol. Mus. Paraense Hist. Nat. 6: 80. 1910. TYPE: Brazil, Amazonas: "ad ripas fl. Japura inferioris," *Ducke s.n. (MG 6751)* (holotype, MG not seen; isotype, BM!).

Discussion. The swollen, cylindrical domatia close to the base of the leaf petiole are characteristic in this species. Very frequently the domatia are longitudinally ribbed. The leaflets are strongly unequal at the base and are sparsely to moderately appressed pubescent on the lower surface. Stipules are usually persistent, 1- to 3-foliose, and 1–2 cm. Petals are linear and glabrous. Stamens are monomorphic. The hypanthium is symmetrical. *Tachigali physophora* is a species of flooded forests. Most collections are from Brazil (Amazonas) with a few collections from adjacent Colombia (Guainía) and Venezuela (Amazonas).

Selected specimens examined. BRAZIL. Amazonas: Anavilhanas Island, *Mori et al.* 21276 (INPA, MO, NY). COLOMBIA. Guainía: Río Inirida, *García-Barriga* 20809 (COL, F, GH). VENEZUELA. Amazonas: on bank of Río Manapiare betw. San Juan & Morrocoy, *Berry* 1601 (MO).

41. *Tachigali pimichinensis* (R. S. Cowan) Zarucchi & Herend., Fl. Venez. Guayana 4: 120. 1998. Basionym: *Sclerolobium pimichinense* R. S. Cowan, Mem. New York Bot. Gard. 10: 85. 1961. TYPE: Venezuela. Amazonas: Río Guainía, along Cano Pimichin, *Maguire et al.* 41830 (holotype, US not seen; isotypes, GH!, MO!, P!).

Discussion. Distinctive in this species are the obtuse to rounded tips of the leaflets. Other characters include the sericeous indument on the lower surface of the leaflets, the occasional presence of small, entire, revolute bracts along the inflorescences, the absence of domatia, and the linear, pilose petals. The hypanthium is symmetrical. Stamens are monomorphic. The leaflets have a symmetrical base.

Tachigali pimichinensis is only known from the type collection.

42. *Tachigali plumbea* Ducke, Bol. Tecn. Inst. Agron. N. 2: 15. 1944. TYPE: Brazil. Amazonas: Manaus, A. *Ducke* 817 (lectotype, designated here, NY not seen; duplicates, IAN!, R!). EPITYPE: *Ducke s.n.* (RB 24289) (epitype, designated here, US!; duplicates, INPA!, K!, P!).

Discussion. Differences between this species and the similar *Tachigali cavipes* are discussed under the latter. *Tachigali plumbea* has sericeous lower surfaces of the leaflets, which have an asymmetrical base, semiterete domatia, dimorphic stamens, and foliose stipules that are often lacking. This species has been reported from the lower Rio Negro and the Rio Madeira.

Ducke (1944) included five collections in his description of *Tachigali plumbea*, four flowering and one sterile. Two collections came from Porto Velho, the other three from around Manaus. Dwyer (1954) cited *Ducke* 817, the sterile collection, as type. He listed two specimens of this collection at NY and US. The lectotype should be chosen from those two, and the NY specimen is here selected as the lectotype. The online image shows as nice a sterile specimen as one can wish for. The specimens from Porto Velho (*Ducke* 228 according to the herbarium sheets, *Ducke* 288 according to the protologue, and *Ducke s.n.* (RB 35419)) differ in minor aspects from the specimens collected around Manaus (*Ducke* 817, *Ducke* 818, and *Ducke s.n.* (RB 24289)). Dwyer (1954) excluded the Porto Velho specimens from *T. plumbea* and placed them in *T. cavipes*. In this treatment, all five collections are included in *T. plumbea*, while acknowledging that further research

may well show that two species are involved. Given this ambiguity, the US sheet of *Ducke s.n.* (RB 24289), from the same locality as the lectotype, is selected here as epitype. It is a good flowering specimen, displaying domatia, stipules, and both surfaces of the leaflets.

Selected specimen examined. BRAZIL. Amazonas: Reserva Florestal Ducke, *Martins & Assunção* 91 (MO).

43. *Tachigali poeppigiana* Tul., Arch. Mus. Hist. Nat. 4: 168. 1844. TYPE: Brazil. Amazonas: Ega, *Poeppig* 2837 (holotype, P!; isotype, L!).

Tachigali polyphylla Poepp., Nov. Gen. Sp. Pl. 3: 60. 1845. TYPE: Brazil. Amazonas: Ega, *Poeppig* 2837 (holotype, W not seen; isotypes, L!, P!).

Discussion. Distinctive in this species are the many pairs of leaflets (often 10 pairs) and the appressed, grey-brown hairs on the calyx. The hypanthium is asymmetrical. Petals are 2–3 × ca. 1.5 mm. Stamens are monomorphic. Domatia are present but may be slender. Stipules are foliose with one pair of lobes, caducous, and occasionally present in sterile specimens. Bracts are sometimes present in the inflorescences and resemble the stipules but are smaller. The base of the leaflets is strongly asymmetrical. This species can be confused with *Tachigali schultesiana*, but the latter differs in the characters mentioned in the key. Dwyer (1954) used the name *T. polyphylla* for this species, but the name *T. poeppigiana* has priority. *Tachigali poeppigiana* is known from a few collections in Amazonas and one from Rondônia, Brazil. Most collections, but not all, come from riverbanks or flooded forest.

Poeppig (1845) was not aware of Tulasne's publication (Tulasne, 1844). Both Poeppig and Tulasne recognized *Poeppig* 2837 as an undescribed species, and both described it independently with the same collection as type (but with different holotypes).

Selected specimens examined. BRAZIL. Amazonas: Humaitá, *Krukoff* 7233 (GH, MO, US). Rondônia: a 13 km de Vilhena, *Vieira et al.* 914 (INPA, MO, US).

44. *Tachigali prancei* (H. S. Irwin & Arroyo) L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 400. 2007. Basionym: *Sclerolobium prancei* H. S. Irwin & Arroyo, Brittonia 26: 268. 1974. TYPE: Brazil. Rondônia: Serra dos Tres Irmãos, N bank of the Rio Madeira, *Prance et al.* 5524 (holotype, NY not seen; isotypes, COL!, F!, GH!, INPA!, MG!, R!, RB not seen).

Discussion. *Tachigali prancei* is easily recognized by its large, oblong to ovate-oblong, tomentulose leaf-

lets with a rounded base, tomentulose inflorescences, and linear, pilose petals. Domatia are lacking. Stipules are foliose, flat, ca. 2.5 cm, but rarely present. The apex of the leaflets tapers to an acute or acuminate tip. Floral bracts are about as long as, or shorter than, the buds. Three collections of this species have been seen, all from Rondônia. *Tachigali prancei* can be confused with *T. chrysaloides*, which differs in having an appressed indument on twigs and leaf rachis and in its large, revolute stipules.

Additional specimens examined. BRAZIL. **Rondônia:** Mun. Jaru, *Cid et al.* 1987 (MEL, MG, MO); Mun. Ariquemes, *Cid et al.* 5058 (MO, NY).

- 15. *Tachigali ptychophysca*** Benth., Fl. Bras. 15: 229. 1870. TYPE: Brazil. Amazonas: "prope Panure ad Rio Uaupes," *Spruce* 2644 (holotype, K!; isotypes, GH!, P!).

Discussion. Although the leaflets of this species are not particularly small (to 11–12 cm long in the GH isotype, to 16 cm long fide Dwyer), they have only two or three pairs of lateral veins and this character alone allows easy identification. Domatia are present and cylindrical. Stamens are dimorphic. The base of the leaflets is symmetrical or nearly so. Bracteoles at the base of the flowers are ca. 3 mm wide, wider than in most other species. Stipules, when present, are foliose with one pair of lobes; lobes are to 1×0.6 cm. The few flowering collections seen in this study all have the lower surface of the leaflets densely appressed (somewhat sericeous) and pubescent. *Tachigali ptychophysca* is known from the upper Rio Negro and along the Rio Vaupes in Brazil and Colombia. This species is similar to *T. lorentensis*; differences are discussed under the latter.

Selected specimens examined. BRAZIL. **Amazonas:** Taracuá, bacia do alto Rio Negro, *Pires & Silva* 7386 (IAN). COLOMBIA. **Amazonas-Vaupés:** Rio Apaporis, Raudal de Jirijirimo, *Schultes & Cabrera* 13488 (COL, F, GH, MO).

- 46. *Tachigali pubiflora*** Benth., J. Bot. (Hooker) 2: 94. 1840. TYPE: Guyana. *Schomburgk* 43 (holotype, K!; isotypes, GH!, L!, P!).

Discussion. This species is best recognized by the combination of densely pubescent leaflets, absence of domatia, dense, erect indument on twigs and inflorescences, oblique hypanthium, narrowly foliose stipules, and dimorphic stamens. The base of the leaflets is symmetrical to slightly asymmetrical. The species can be confused with *Tachigali rigida*, which differs in the presence of domatia. *Tachigali pubiflora* is known from Guyana and adjacent Venezuela. Most specimens have a dense indument on the lower surface of the leaflets; however, an occasional

specimen (for instance, *Clarke* 277 from Guyana) has a sparse indument.

Selected specimens examined. GUYANA. Kaieteur Plateau, forest along Potaro River, *Cowan & Soderstrom* 2089 (F, US). VENEZUELA. **Bolívar:** Campamento Ucaima, sureste de Canaima, *Steyermark* 106423 (US).

- 47. *Tachigali richardiana*** Tul., Arch. Mus. Hist. Nat. 4: 166. 1844. TYPE: French Guiana. *Richard Herbarium s.n.* (holotype, P!).

Tachigali sulcata Benoist, Bull. Mus. Hist. Nat. (Paris) 31: 469. 1925. Syn. nov. TYPE: French Guiana. Gourdonville, *Benoist* 1574 (holotype, P!).

Tachigali bracteolata Dwyer, Ann. Missouri Bot. Gard. 41: 233. 1954. Syn. nov. TYPE: French Guiana. *Martin s.n.* (holotype, F!).

Discussion. *Tachigali richardiana* is best recognized by the combination of terete leaf rachises, dimorphic stamens, a basal patch of hairs on the outer surface of the petals, and relatively few lateral veins (4 to 7 pairs per leaflet). It is closely related to *T. alba*, from which it differs in the characters given above and in the slightly larger petals (5–7 mm long vs. 4–5 mm long in *T. alba*). Domatia are lacking, and stipules have not been seen on any of the collections. Occasionally, a collection of *T. richardiana* may not have all the characters mentioned above. For instance, *Sabatier* 987 has five pairs of lateral veins and dimorphic stamens, but the petals lack the hairs on the outer surface. *Tachigali barnebyi* is also similar, but differs from *T. richardiana* in its persistent stipules and the gland-dotted lower surface of the leaflets. *Tachigali richardiana* has been reported from terra firme forests in French Guiana and Brazil. Benoist considered *T. sulcata* different from *T. richardiana* in its slightly denser indument and a different shape of bracts. Dwyer (1954) published *T. bracteolata* as a distinct species based on its long bracts. Here, these species are treated as synonyms of *T. richardiana*.

Selected specimens examined. BRAZIL. **Pará:** Estrada do Munguba, *Silva* 3075 (IAN). FRENCH GUIANA. RN2 Cayenne–Régina, pk. 79 Camp Hervo, *Sabatier & Prevost* 5050 (MO).

- 48. *Tachigali rigida*** Ducke, Arq. Inst. Biol. Veg. 4(1): 12. 1938. TYPE: Brazil. Amazonas: Igarape Macacuny prope Cucuhy, *Ducke s.n.* (RB 35423) (holotype, RB not seen; isotype, K!).

Tachigali rigida var. *argentata* Ducke, Arq. Inst. Biol. Veg. 4: 12. 1938. TYPE: Brazil. Amazonas: Rio Curicuriari, affl. Rio Negro, *Ducke s.n.* (RB 35422) (holotype, RB!).

Discussion. This species is easily recognized by the combination of the densely appressed pubescent lower surface of the leaflets, the symmetrical base of

the leaflets, the presence of domatia, and the large flowers with dimorphic stamens. The hypanthium is oblique. Stipules are foliose, with one pair of lateral lobes. The characters used by Ducke to recognize variety *argentata* (absence of reddish hairs on lower surface of leaflets, absence of hairs on the upper surface of mature leaflets) are variable, and the variety is here included in synonymy. *Tachigali rigida* resembles *T. pubiflora*; the two species can be distinguished by the presence of domatia in *T. rigida* and their absence in *T. pubiflora*. *Tachigali rigida* is also similar to *T. grandistipulata*, but the latter has smaller flowers with monomorphic stamens, these about as long as the petals. *Tachigali rigida* has stamens much longer than the petals. *Tachigali rigida* is known from the upper Rio Negro in Brazil, from one collection from Vaupes, Colombia, and from Amazonas in Venezuela, frequently growing along rivers in seasonally inundated forest.

Selected specimens examined. BRAZIL. **Amazonas:** entre Camanaus e Curicuriari, *Silva et al.* 1649 (INPA). COLOMBIA. **Vaupes:** at confluence of Ríos Guainia and Casiquiare, *Schultes & Lopez* 9389 (F, GH, IAN, US). VENEZUELA. **Amazonas:** frequent along Ríos Pacimoni and Yatua, *Maguire et al.* 41578 (GH, IAN, MO, US).

49. *Tachigali schultesiana* Dwyer, Bot. Mus. Leaflet 18: 152. 1958. TYPE: Colombia. Amazonas—Vaupes: Río Apaporis, *Schultes & Cabrera* 14045 (holotype, MO!; isotypes, GH!, US!).

Discussion. Characteristic in this species are the many pairs of leaflets (up to 15 pairs), the dense, puberulous, brown indument on inflorescences and flowers, and the nearly symmetrical flowers. Stamens are monomorphic, stipules are foliose but rarely present, and domatia are present and terete. Petals are elliptic, ca. 4 × 2 mm. The base of the leaflets is strongly asymmetrical. The type has flowers and young fruits; the young fruits (15 mm long) are seated on a slender stipe, 5 mm long. *Tachigali poeppigiana* is very similar, but can be distinguished by the differences mentioned in the key. *Tachigali schultesiana* is known from Colombia (Vaupes, Caqueta, Amazonas) and Peru (Loreto).

Selected specimens examined. COLOMBIA. **Amazonas—Vaupes:** Río Apaporis, *García-Barriga* 13943 (COL, US). **Caqueta:** Araracuara, *Cardenas et al.* 4421 (MO). PERU. **Loreto:** Jenaro Herrera, *Revilla* 1220 (MG, MO).

50. *Tachigali setifera* (Ducke) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Basionym: *Sclerolobium setiferum* Ducke, Arq. Inst. Biol. Veg. 2: 42. 1935. TYPE: Brazil. Amazonas: “silva non inundabilis colinae Campos Salles prope Manaos,” Ducke

s.n. (RB 23329) (lectotype, designated by Zarucchi & Herendeen in Brako & Zarucchi, 1993: 1254, US!; duplicate, P!).

Discussion. The type has a characteristic, rather dense indument on the lower surface of the leaflets, consisting of appressed, whitish hairs that radiate from a central point in various directions. This indument has not been found on any other species. Stipules are 3-foliose, with the segments revolute and are up to 3 cm long on young shoots. Domatia are lacking. Petals are linear and pilose. The base of the leaflets varies from obtuse to subcordate and is symmetrical. Relationships are with a group of species including *Tachigali rugosa*, *T. prancei*, *T. vasquezii*, and *T. chrysaloides*. These species all differ from *T. setifera* in indument type.

A number of collections that, in all other characters, match *Tachigali setifera* do not have the indument of short, appressed, white hairs. Instead, the lower surface of the leaflets is glabrous or has scattered, short, erect, hairs or a brown scurf. Both forms have a similar geographical distribution: the form with the appressed, white hairs is known from Bolivia, Peru, Ecuador, and Brazil (Amazonas, Mato Grosso, and Rondônia) and one collection from Colombia, and the form lacking these hairs is known from Bolivia, Peru, and Brazil (Acre, Amazonas, and Rondônia) and single collections from Ecuador and Colombia. Apparently, the two forms do not occur together. Eight collections from the Tambopata area in Peru all have the short, white indument, while eight collections from the Bosque Nacional Alexander von Humboldt, Ucayali, Peru, all lack the short, white hairs. Both forms are placed in *T. setifera* largely because of their overlapping distributions and great similarity in all characters except the indument on the lower surface of the leaflets. In the species identification list, specimens with short, white hairs are identified as *T. setifera* s. str., while specimens lacking these hairs are identified as *T. setifera* s.l.

Selected specimens examined of Tachigali setifera s. str. BOLIVIA. **Pando:** Manuripi, cerca Puerto America, *Jardim* 1117 (MO, NY). BRAZIL. **Amazonas:** Mun. Borba, *Zarucchi* 2857 (INPA, MG). **Rondônia:** W bank of Rio Madeira, 2 km below mouth of Rio Abuña, *Prance et al.* 6037 (COL, INPA, MG, NY, US). ECUADOR. **Morona Santiago:** 5–10 km E of Logroño, *Little et al.* 630 (US). PERU. **Huánuco:** Pachitea, Codo de Pozuzo, *Foster* 9295 (MO). **Loreto:** Río Corrientes, upriver from Tnte. Lopez oil camp, *Gentry et al.* 18951 (MO). **Madre de Dios:** Tambopata Nature Reserve, *Gentry & Jaramillo* 57661 (MO).

Selected specimens examined of Tachigali setifera s.l. BOLIVIA. **Beni:** Prov. Vaca Diez, *Boom* 4394 (MO, NY). **Santa Cruz:** Parque Nacional Noel Kempff, *Arroyo et al.* 644 (MO). BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, *Aluisio* 28 (INPA). **Mato Grosso:** margen esquerda de Rio Juruena, *Rosa & Santos* 2074 (MO, NY). **Rondônia:** Mun.

Costa Marques, *Cid Ferreira* 8736 (INPA, MEL, MO). ECUADOR. **Morona-Santiago:** 56 km SE de Taisha, *Ortega U.* 214 (US). PERU. **Amazonas:** Quebrada chichijam entsa, *Ancuash* 275 (MO). **Huánaco:** Tingo Maria, *Burgos* 11 (US). **Madre de Dios:** Km 15 de carretera Iberia-Iñapari, *Ruiz C.* 27 (MO). **Ucayali:** Aguaytia-Pampa el Sacramento, *Gutierrez R.* 43 (F, NY, US).

51. *Tachigali tinctoria* (Benth.) Zarucchi & Herend., Monogr. Syst. Bot. Missouri Bot. Gard. 45: 1254. 1993. Basionym: *Sclerolobium tinctorium* Benth., Hooker's J. Bot. Kew Garden Misc. 2: 236. 1850. TYPE: Brazil. Pará: prope Caripi, *Spruce s.n.* (holotype, K!; isotype, P!).

Sclerolobium reticulosum Dwyer, Lloydia 20: 98. 1957. *Tachigali reticulosa* (Dwyer) Zarucchi & Herend., Fl. Venez. Guayana 4: 120. 1998. Syn. nov. TYPE. Brazil. Amazonas: Humayta, *Krukoff* 7188 (holotype, MO!; isotypes, BM!, GH!, K!).

Discussion. This species is best recognized by the absence of domatia and the sparsely appressed pubescent to glabrous, oblong leaflets with an asymmetrical base. Petals are linear and glabrous. Stipules, when present, are pectinate and appressed pubescent. It is very similar to *Tachigali vulgaris*, the main difference being the obviously pedicellate flowers in *T. vulgaris* versus sessile or very shortly pedicellate flowers in *T. tinctoria*. Most collections of this species are from the Brazilian state of Pará, with a few collections from Amazonas and Venezuela. No differences between the specimens placed by Dwyer (1957a) in his *Sclerolobium reticulosum* and specimens of *T. tinctoria* have been found in this study. *Sclerolobium reticulosum* is consequently placed in synonymy under *T. tinctoria*.

Selected specimens examined. BRAZIL. **Amazonas:** Rio Negro, Patauiry, *Froes* 22718 (COL., US). **Pará:** Mun. Almeirim, Mt. Dourado, *Pires & Silva* 1376 (INPA, MG, NY). **Rondônia:** Mun. Costa Marques, 123 km de Costa Marques, *Cid Ferreira* 8672 (INPA, MEL, MO). **Roraima:** Caracarai, *Ducke* 1595 (F, MG, NY). VENEZUELA. **Amazonas:** alrededores de Puerto Ayacucho, *Huber* 4766 (NY, US).

52. *Tachigali vaupesiana* van der Werff, sp. nov. TYPE: Colombia. Vaupes: Abiu Igarape, E of Mitu, 20 Nov. 1945, *P. Allen* 3366 (holotype, MO!; isotypes, GH!, NY!). Figure 13.

Sclerolobium odoratissimum var. *latifolium* Dwyer, Lloydia 20: 83. 1957. TYPE: Brazil. Amazonas: São Paulo de Olivença, *Krukoff* 8988 (holotype, MO!; isotypes, F!, GH!, K!, US!).

Tachigali chrysophyllae (Poepp.) Zarucchi & Herend. similis, sed ab ea foliolis basi aequilateralibus et stipulis integris margine revolutis (nec pectinatis) recedit.

Tree, to 35 m; twigs minutely appressed pubescent, becoming glabrous with age. Leaves 15–25 cm, with 2

to 5 pairs of leaflets; leaf petiole with a swollen domatium 1.5–2 cm from the base, this 2.5–4 cm, the first pair of leaflets attached just above the domatium; leaf stalk finely appressed, grey pubescent; leaflets elliptic, 7–15 × 3–6 cm, the base obtuse, symmetrical or nearly so, the tip acute, the upper surface glabrous, lower surface densely appressed, ± sericeous, pubescent, petiolules 3–5 mm, with a similar indument as the leaf stalk; stipules small, 6–9 mm, with a short (to 3 mm long) stalk, entire, the margin revolute, infrequently present; bracts similar to the stipules occur in the inflorescences. Inflorescences to 25 cm, paniculate, finely and densely appressed pubescent, the flower-bearing branchlets slender, flexuous, to 12 cm long. Flowers with a short (ca. 1 mm) pedicel, densely grey pubescent; hypanthium symmetrical, ca. 1 mm; sepals elliptic, ca. 2 mm; petals ca. 2 mm, linear, densely yellow pubescent; stamens monomorphic, ca. 2.5 mm, with some yellow hairs near the base, the distal 2/3 glabrous; ovary ca. 2 mm, moderately pubescent with stiff, brown hairs, centrally attached in the hypanthium. Fruits not seen.

Discussion. *Tachigali vaupesiana* is only known from three collections: the type, a second collection from São Paulo de Olivença, and a third from São Pedro on the Rio Vaupes, both in Amazonas, Brazil. The type specimens had been previously annotated as *T. chrysophylla* or *Sclerolobium* aff. *chrysophyllum*. *Tachigali vaupesiana* differs notably from that species in the symmetrical base of the leaflets and in its small, entire stipules with a revolute margin. The stipules are inconspicuous; similar bracts are found in the inflorescences. They are present in all four duplicates of the type collection. Another difference between the new species and *T. chrysophylla* is in the position of the domatia: in *T. vaupesiana* the domatia occur below the first pair of leaflets, while in *T. chrysophylla* the domatia often occur distal to the first pair of leaflets. Similar small, entire bracts are also present in *T. eriopetala*, and this species is here considered to be very similar (leaf shape, indument) to *T. vaupesiana*, the main difference being the absence of domatia in *T. eriopetala*. All collections of *T. eriopetala* seen in this study are from the Manaus region or from Pará and none have domatia. Thus, *T. eriopetala* is here considered as the closest relative of *T. vaupesiana*, and *T. vaupesiana* is recognized as a distinct species based on the presence of domatia and its distribution. *Sclerolobium odoratissimum* var. *latifolium* is placed in synonymy of *T. vaupesiana*. Its type, *Krukoff* 8988, agrees well in leaf and indument characters with *T. vaupesiana*, and it has the same domatia. Stipules are lacking in the two duplicates of *Krukoff* 8988 seen in this study; this is probably due to



Figure 13. *Tachigali vaupesiana* (holotype).

these specimens being in young fruit by which time the stipules have commonly fallen off. Because of the importance of floral characters, a flowering collection is chosen as the type of *T. vaupesiana*. *Sclerolobium odoratissimum* var. *latifolium* is not raised to species rank; otherwise, a collection with young fruits would be the type collection.

IUCN Red List category. This species is known only from three collections and has been given the listing of Data Deficient (DD) (IUCN, 2001).

Paratype. BRAZIL. **Amazonas:** Rio Waupes, Mun. São Gabriel da Cachocira, *Damião* 2998 (INPA).

53. *Tachigali venusta* Dwyer, Ann. Missouri Bot. Gard. 41: 235. 1954. TYPE: Brazil. Pará: Tapajoz, Boa Vista, *Capucho* 418 (holotype, F not seen).

Discussion. *Tachigali venusta* is very similar to *T. plumbea* and *T. cavipes* in its sericeous pubescence, semiterete domatia, dimorphic stamens, and asymmetrical base of the leaflets. It can be separated from the other two species by its stipules with filiform segments and the nearly sessile flowers. Stipules are not always present, but in that case the nearly sessile flowers allow identification. The upper surface of the leaflets is almost as densely pubescent as the lower surface, while in *T. plumbea* and *T. cavipes* the upper surface is often less densely pubescent. The type of *T. venusta* has not been seen, and the species concept is based on the paratype *Ducke* 1989. *Tachigali venusta* has been reported from terra firme forest on sandy soil in the Brazilian states of Amazonas, Pará, and Rondônia.

Selected specimens examined. BRAZIL. **Amazonas:** Manaus, Reserva Florestal Ducke, *Rodrigues* 5431 (F, INPA, US). **Pará:** 27 km NE of Itaituba, *Prance et al.* 25804 (IAN, MG, MO, US). **Rondônia:** Mun. Porto Velho, *Cid Ferreira* 7451 (INPA, MEL, MO).

54. *Tachigali vulgaris* L. F. Gomes da Silva & H. C. Lima, Rodriguésia 58: 400. 2007. Replaced synonym: *Sclerolobium paniculatum* Vogel, Linnaea 11: 397. 1837, non *Tachigali paniculata* Aubl., 1775. TYPE: Brazil. Mato Grosso: in regione Cujaba, *Manso & Lhotzky s.n.* (holotype, B†; isotype, MO!).

Discussion. *Tachigali vulgaris* is a common and widespread species, best recognized by moderately dense, appressed indument on the lower surface of the leaflets, caducous stipules and domatia, the glabrous, linear petals, and the unequal base of the leaflets. It is very similar to *T. tinctoria*, which differs in its sessile flowers; flowers of *T. vulgaris* are distinctly pedicellate. The type of this species is from a collection by

Manso and Lhotzky from the Cuiabá region in Mato Grosso (Vogel, 1837). Bentham (1870) recognized three varieties of *Sclerolobium paniculatum*: variety *paniculatum*, variety *rubiginosum* (Tul.) Benth., and variety *subvelutinum* Benth. The latter two varieties have not yet been reported from the Amazon forests. Dwyer (1957a) published an additional variety, variety *peruvianum* Dwyer, from Peru. These varieties of *S. paniculatum* have now been raised to species, as *T. peruviana*, *T. rubiginosa* (Tul.) Oliveira-Filho, and *T. subvelutina*. Specimens of *T. vulgaris* are known from Pará, Mato Grosso, Rondônia, and a few collections from Amazonas and Bolivia. Many specimens from Pará differ in indument from specimens from Mato Grosso and Rondônia; the indument on twigs is less dense and predominantly erect, and the leaflets also have a partly erect indument. However, there are several intermediate specimens, and *T. vulgaris* is here accepted as a species with a somewhat variable indument, occurring in dry forest (campos, campinas) along the southern margin of the Amazon rainforest from Pará to Bolivia. Both Lemee (1952) and Oliveira Filho (2006) mention that *S. paniculatum* and *S. melinonii* are probably conspecific. Here, *S. melinonii* (as *T. melinonii*) and *T. vulgaris* are considered as distinct species, largely based on the presence of the characteristic small, stellate hairs on *T. melinonii*.

INCOMPLETELY KNOWN SPECIES

Following is a list of validly published species of which no specimens have been seen or which are only known from fruiting collections. Also included is a likely undescribed species.

Sclerolobium herthae Harms, Notizbl. Bot. Gart. Berlin-Dahlem 15: 46. 1940. TYPE: Ecuador. Pastaza: Mera, *Schultze-Rhonhof* 2922 (holotype, B).

The type and only collection was presumably destroyed in the Berlin herbarium during World War II.

Tachigali multijuga Benth., Fl. Bras. 15(2): 229. 1870. TYPE: Brazil. "in sylvis Capoeiras pr. Uananuca ad Rio Negro," *Spruce* 2022 (holotype, K not seen).

Bentham also mentioned very similar specimens collected near Rio de Janeiro. Ducke (1949) stated that he had not seen specimens from the upper Rio Negro, the type locality, but that it was frequent around Rio de Janeiro. Dwyer (1954) cited, in addition to the Spruce collection, six collections from southern Brazil. Bentham compared it with *Tachigali poeppigiana*, from which it differs in having much larger flowers. Specimens identified as *T. multijuga* from

southern Brazil indeed have very large flowers, but no specimens like it (characterized by large flowers and 9 to 15 pairs of leaflets) have been seen from the Rio Negro in Amazonas, and it is not certain if *T. multijuga* occurs in Amazonas. The specimens from southern Brazil formerly placed in *T. multijuga* are now included in *T. paratyensis* (Vell.) H. C. Lima.

Tachigali vasquezii Pipoly, Sida 16: 408. 1995.
TYPE: Peru. Amazonas: Valle del Río Santiago, Quebrada Caterpiza, *Huashikat 1910* (holotype, MO!).

The holotype is a fruiting specimen. The lower surface of the leaflets is densely tomentulose, leaflets are oblong, with a rounded base, tertiary venation is raised on the lower surface, and the hypanthium is symmetrical. Domatia and stipules are absent. A second collection, *Huashikat 1408* (MO), is also in fruit. Both collections were made 2–3 km from the community of Caterpiza. The sterile paratypes of *Tachigali vasquezii* are here considered to be *T. setifera* s. str. The differences in indument between *T. setifera* and *T. vasquezii* are striking, and no intermediates have been seen. Nevertheless, I consider the two species closely related, based on the oblong leaflets with a rounded, symmetrical base.

***Tachigali* sp. 1**

Tall trees (height not given), resembling *Tachigali chrysophylla* in the sericeous lower surface of the leaflets and shape and position of the domatia (3–5 cm from base of leaf stalk). It differs from that species in having pilose (not glabrous) petals and a symmetrical base of the leaflets that is recurved. Leaflets are 9–20 cm, elliptic to oblong. One sterile collection has stipules; these are ca. 1.5 cm, pinnately divided, the segments linear and distally widened in a small pouch (Fig. 1G). No other species from northern South America possesses such stipules. The hypanthium is symmetrical. The NY specimen of *Pires 3696* has old flowers in a pocket. This is very likely an undescribed species, but because good flowers are lacking, it is not described here.

Specimens examined. BRAZIL. **Amazonas:** 400 km E of Humaitá, st., *F. Rickson B-44A-85* (MO). **Border area of Amazonas, Pará, and Mato Grosso:** Boca do Rio Jurueña, old flowers, *Pires 3696* (COL, IAN, INPA, NY); Rio São Manoel, limite Pará-Mato Grosso, fallen fruits and leaflets, *Pires 3828* (IAN).

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THE TROPICAL FLORA OF SOUTHERN YUNNAN, CHINA, AND ITS BIOGEOGRAPHIC AFFINITIES¹

*Zhu Hua*²

ABSTRACT

The flora of Xishuangbanna in southern Yunnan, southwestern China, consists of 3340 native seed plant species belonging to 1176 genera and 182 families. Tropical floristic elements at the generic level form a major contribution (78.3%) to the total flora of southern Yunnan, of which the dominant geographic elements are those of tropical Asian distribution. The tropical Asian flora of Xishuangbanna is similar in composition to other tropical floras from Yunnan, especially in the families with the most species richness. These regional floras have similarities of more than 89% at the family level and more than 76% at the generic level, but share only 43%–50% similarity at the specific level. Comparison with mainland Southeast Asia (Thailand) and Malesia (Malay Peninsula) floras reveals that most of the dominant families from southern Yunnan are also dominant in mainland Southeast Asian and Malesian floras. The floristic similarities between the flora of southern Yunnan and those of tropical Asia are more than 80% at the family level and more than 64% at the generic level. This suggests that the tropical flora of southern Yunnan has a close affinity with tropical Asian flora and supports the idea that the flora of southern Yunnan, together with mainland Southeast Asian flora, belongs to the Indo-Malaysian floristic subkingdom of the Paleotropical kingdom as suggested by Takhtajan, or the Malaysian subkingdom of the Paleotropical kingdom as suggested by Wu and Wu. However, situated at the northern margin of tropical Asia, the flora of southern Yunnan comprises less strictly tropical elements compared to Malaysian flora and, consequently, represents only a marginal type of Indo-Malaysian flora. The tropical flora of southern Yunnan is supposed to be derived from tropical Asian flora with the formation of the eastern monsoon climate after the Tertiary.

Key words: Biogeographic affinity, southern Yunnan, floristic composition.

The tropical area of southern China is located at the northern edge of tropical Asia and is composed of the extreme southeastern part of Xizang (Tibet) among the lower valleys of the southern Himalayas, southern Yunnan, southwestern Guangxi, southern Taiwan, and Hainan separately. The largest tropical area still covered by forests is in southern Yunnan, the most southwestern region of China, which is also a key area in biogeography and a hotspot for biodiversity (Myers, 1998). This is a mountainous region at the northern margin of mainland Southeast Asia, with a monsoon climate and a slightly lower annual mean temperature (ca. 21°C) and lower annual precipitation (average, 1500 mm) in lowlands and valleys compared to the main tropical rainforest areas of the world, e.g., Malaysia (Richards, 1996). The tropical forest in southern Yunnan is therefore intermediate between classic tropical rainforests and monsoon forests as defined by Schimper (1903), or a type of subtropical rainforest, which differs in various aspects from the true tropical rainforests described by Richards (1952).

After the Chinese-Russian expedition to remote areas of southwestern China, including southern Yunnan, in the late 1950s, papers on the tropical rainforest vegetation (Fedorov, 1958; Wang, 1961) and tropical flora (Fedorov, 1957; Wu, 1965) of this part of China were published. It was basically accepted that biogeographically real tropical rainforests exist in southwestern China, but these were considered to be a different type from those in Indo-Malaysia because of the lack of representatives from Dipterocarpaceae, which dominate the rainforests of tropical Southeast Asia.

Botanical interest was rekindled in the 1970s by the discovery of a dipterocarp forest in southern Yunnan, thus the Indo-Malaysian affinity of the tropical flora of Yunnan was reconsidered. Further results from biogeographic and ecological studies of the vegetation and flora of tropical southern Yunnan revealed that it does in fact comprise a part of the Indo-Malaysian flora (Zhu, 1992, 1993a, b, 1994, 1997, 2004; Zhu et al., 1998a, b, 2001, 2003; Zhu &

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²Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Xue Fu Road 88, Kunming 650223 Yunnan, People's Republic of China. zhuh@xtbg.ac.cn.

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